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STAFF APPRAISAL REPORT

KOREA

PUSAN PORT PROJECT

April 25, 1986

Projects Department
East Asia and Pacific Regional Office
Transportation Division

CURRENCY EQUIVALENTS

Currency unit	=	Won
US$1	=	Won 900
Won 100	=	US$0.111
Won 1,000,000	=	US$1,111

FISCAL YEAR

January 1 - December 31

WEIGHTS AND MEASURES

1 meter (m)	=	3.28 feet (ft)
1 square meter (m^2)	=	10.76 square feet (ft^2)
1 cubic meter (m^3)	=	35.29 cubic feet (ft^3)
1 kilometer (km)	=	0.62 miles (mi)
1 square kilometer (km^2)	=	0.39 square miles (sq mi)
1 hectare (ha)	=	2.47 acres (ac)
1 metric ton (mt)	=	1,000 kilograms (kg) or 2,240 pounds (lb)
1 revenue ton (rt)	=	on average approximately 600 kg or 1322.4 lb

ABBREVIATIONS

ADB	-	Asian Development Bank
CFS	-	Container Freight Station
CY	-	Container Yard
DMPA	-	District Maritime and Port Authority
dwt	-	deadweight tons
EPB	-	Economic Planning Board
GNP	-	Gross National Product
GOK	-	Government of Korea
GRT	-	Gross Registered Tonnage
KMI	-	Korean Maritime Institute
KMPA	-	Korean Maritime and Port Administration
KNR	-	Korean National Railroad
MLW	-	Mean Low Water
MOA	-	Ministry of Agriculture
MOC	-	Ministry of Construction
MOF	-	Ministry of Finance
MOHA	-	Ministry of Home Affairs
MOT	-	Ministry of Transportation
NFA	-	National Fisheries Administration
PCTOC	-	Pusan Container Terminal Operating Company
PDMPA	-	Pusan District Maritime and Port Authority
PPCO	-	Pusan Port Construction Office
TCMC	-	Transport Coordination Minister's Conference
TEU	-	Twenty Foot Container Equivalent Unit
TOC	-	Terminal Operating Company

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PUSAN PORT PROJECT

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This report is based on the findings of a November 1985 appraisal mission to Korea comprising Messrs. A. F. Ballereau (Mission Leader), I. Mobarek (Port Engineer), E. James (Financial Analyst), W. K. Cho (Economist), J. Newman (Port Engineer, Consultant) and W. Thompson (Railway Specialist, Consultant).

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KOREA

PUSAN PORT PROJECT

Loan and Project Summary

Borrower: Republic of Korea

Beneficiary: Korea Maritime and Port Administration (KMPA)

Amount: US$141 million equivalent

Terms: Fifteen years, including three years of grace, at the standard variable interest rate.

Project Description: The project would improve capacity by constructing additional specialized container berths at Pusan port. The project would also reduce congestion in the city of Pusan by providing an on-dock storage area to replace storage areas in the city (Off-Dock CYs). It will meet the Government's objective of increasing the efficiency and reducing the costs of container handling and inland transportation. It will also improve management and financial control over ports' activities and will strengthen port planning capabilities.

Specifically, the project would: (a) increase capacity by construction of 1,704 meters of breakwater, a 3 berth container terminal with the required infrastructure and utilities and provision of the necessary container handling equipment; (b) improve the rail capacity by providing equipment for rail cars; (c) provide training for port planners and technical assistance to: (i) study and implement measures to improve financial management; (ii) update the Master Plan for Pusan port; (iii) carry out studies to improve existing container operations, define the management and operating rules for the proposed terminal, improve container distribution systems in Korea, and the port access to the expressway; (iv) study relocation of Off-Dock CYs in Pusan area to a proposed on-dock CY; and (d) implement two Action Plans, one to strengthen KMPA's financial and managerial functions and the other to address the rationalization of container handling and distribution in Korea.

Risks: There are no unusual risks associated with the project in that all components involve proven technology that has been in extended use in Korea and in other parts of the world. The only risk involves possible delays in project completion if there is a shortage in local currency.

Estimated Costs:

	Local	Foreign	Total
	US$ million		
Civil Works	101.9	124.5	226.4
Equipment for container handling	1.9	23.6	25.5
Technical assistance	3.0	1.3	4.3
Base Cost	106.8	149.4	256.2
Customs duties and value added tax	13.1	-	13.1
Physical contingencies	5.3	7.5	12.8
Price contingencies	16.2	30.0	46.2
Total Project Cost	141.3	187.0	328.3

Financing Plan:

Bank loan	-	141.0	141.0
Government	141.3	46.0	187.3
Total	141.3	187.0	328.3

Estimated Disbursement:

Bank FY	1987	1988	1989	1990	1991	1992
	US$ million					
Annual	18	32	30	26	27	8
Cumulative	18	50	80	106	133	141

Rate of Return: 35%

Maps: IBRD 19232 and IBRD 19536

KOREA

PUSAN PORT PROJECT

I. THE TRANSPORT SECTOR

A. Geographic and Economic Setting

1.01 The Republic of Korea has a land area of 98,500 km^2, about 70% of which is mountainous. Agriculture is confined to about 22,600 km^2, or only 23% of the total area, mainly in the river valleys, lower hillsides and coastal plains. The climate is seasonal with very cold dry winters and hot humid summers. Annual rainfall averages 800 mm to 1,400 mm with about 60% falling between June and September. The land mass is drained by a well developed river system with seasonal variations in flow which cause frequent flooding. The rugged terrain, extensive river system and severe winter climate make the construction of transport facilities, particularly roads, difficult and costly.

1.02 The population is presently estimated at about 40 million and is growing at an annual rate of 1.7%. Population density is estimated at 388 per km^2 of total area or 1,702 per km^2 of agricultural land. Urban population is estimated to be growing at an annual rate of 4.6% and has increased from 40.7% of the total in 1970 to 55.9% in 1982. The increasing urban population has created significant transport demand in the areas around the cities and industrial centers and between them, particularly in the Seoul-Pusan (Kyongbu) Corridor.

1.03 Korea's export-led industrialization has been among the most successful examples of economic development in recent history. During 1962-78, real GNP grew by 10% p.a. and per capita income more than tripled in real terms. After a brief but serious recession in 1979-81, the Korean economy appears to have recovered its growth momentum, with real GNP increasing by 9.5% in 1983 and 7.6% in 1984, although it slowed down to 5.0% in 1985. Coupled with industrialization and urbanization, major developments and changes in the transportation sector complemented and supported the transformation of Korea's economy. Passenger traffic tripled between 1962 and 1971 and tripled again by 1984; freight increased nine times and five times respectively during the same periods.

B. The Transport System

1.04 Throughout much of the past 20 years, the transport system has been strained by the demands of rapid growth and has required massive public sector investments in transport infrastructure. The Government allocated up to 23% of its total capital expenditure to expand and modernize transport infrastructure from 1967 to 1977 tapering down to about 15% in the Fourth (1977-81) and Fifth Plans (1982-86). Investments have been concentrated on the Seoul-Pusan axis where most industrial development is taking place and on other corridors serving the northeastern and southeastern parts of Korea.

1.05 Substantial changes in the modal distribution of traffic are illustrated by traffic statistics for the 1966 to 1984 period (Tables 1.1 and 1.2). For freight traffic, the road and coastal shipping shares increased from 8% to 36% and from 10% to 27%, respectively while movements by rail, although showing growth in absolute terms, fell from 81% of total ton-km to 32%. These changes reflect both the economic advantages of the various modes and the different growth rates of the industries served, as rail and coastal shipping became concentrated on long distances and bulk commodities while road transport handled the short distances and more general cargo. For passenger traffic, rapidly expanding personal incomes generated large increases in personal travel, mainly by public transport such as express trains and buses. High taxation of private cars and gasoline has limited motorization to a level significantly below that of other countries with income levels comparable to those of Korea. Between 1966 and 1984, the rail share of total passenger-km fell from 42% to 22% while the road share increased from 56% to 75% over the same period.

1.06 The Government of Korea's (GOK) basic objective in the past has been to increase the capacity of the transport system in line with projected traffic growth and to avoid major bottlenecks. This objective has been largely achieved. The present system is reasonably well balanced and there is little uneconomic allocation of traffic among the various modes. Investments in transportation have been linked to broader concerns in Korea's spatial and economic planning. For example, considerable efforts have been made to develop new industrial complexes in coastal areas, to take advantage of Korea's natural potential in harbors, and to exploit low-cost coastal shipping while avoiding excessive congestion on road and rail. Similarly, in its efforts to ensure that appropriate development priorities were reflected in the allocation of scarce transportation resources among the competing claims, the Government has tightly regulated the sector, with a restrictive licensing system and administered pricing for all transport activities. These tight regulations, which have not always enhanced efficiency in transport, are under review.

1.07 Large investments in transportation infrastructure have been complemented by a considerable effort to improve the efficiency of the transportation system, through the establishment and strengthening of institutions to plan, construct, maintain and operate the facilities and services. In the public sector, institutions such as the Korean National Railroad (KNR), the Bureau of Public Roads (BPR) in the Ministry of Construction (MOC), the Korea Highway Corporation (KHC), and the Korea Maritime and Port Administration (KMPA) have been established or strengthened, in many instances with increasing financial and managerial responsibility. In the private sector, a highly efficient contractor system has evolved for civil works which reflects both the insistence on competitive bidding in the award of contracts as a matter of policy and the large volume of construction that has been carried out in Korea during the past 20 years. There are now some 500 firms capable of handling a broad range of public works. Furthermore, with government encouragement, the major construction firms have successfully expanded their construction activities overseas; in 1981, Korean contractors won overseas contracts valued at over US$13 billion, though due to adverse international conditions, new orders dwindled to less than half this amount by 1985.

1.08 Details on development of the transport system during the last four Five-Year Investment Plans (1962-81) together with the Bank's involvement in the sector are given in Annex 2.

C. Transport Sector Objectives and Issues in the 1980s

1.09 Objectives. The Government's main goals for the transport sector as stated in the Fifth Five-Year Economic and Social Development Plan (FFYP) (1982-86) are to: (a) selectively increase transport capacity by modernizing equipment and optimizing investments in the sector; (b) enhance transport efficiency by improving intermodal traffic allocation and conserving energy; and (c) strengthen maintenance activities. A new emphasis to be set as part of the Sixth Plan (1987-91) will concern the promotion of a more balanced regional development, by encouraging growth outside the largest cities.

1.10 These FFYP goals have been appropriate and timely and are still valid for the future. Although recovery from the 1979/81 recession was completed by 1984 when the GNP growth rate was 7.5% and inflation down to 3% p.a., new signs (GNP growth reached 5.5% in 1985) indicate that the growth for the medium term is likely to be more modest than during the 1970s. The recent economic slowdown has led to postponing investments planned to improve further transport capacity and quality of service which now need to be more closely adjusted to the actual growth of traffic for each mode. These delays resulted also from constraints in the capacity of the public sector to finance the necessary transport infrastructure improvements due to both budgetary limitations and the Government's policy of limiting foreign borrowings.

1.11 Nevertheless, the FFYP projection for an average GNP growth rate of 7.6% p.a. over the period 1982-86 is likely to be achieved. The corresponding increase in transport demand estimated at about 47 billion passenger-km and 10 billion ton-km, respectively 50% and 30% over the Fourth Plan Period (Tables 1.3, 1.4 and 1.5), might also be reached. However, investments in transportation (public and private) have increased less than the 45% originally planned. These would have amounted to some US$16.3 billion, calculated at 1980 prices and exchange rates; revised actual expenditures data are not available. Investments in subways and aviation will have absorbed a larger fraction of the total as will road vehicles and ships, leaving investments in the railway system, road and port infrastructure to increase by less than 20% over Fourth Plan outlays (Table 1.6).

1.12 Issues. The last major Bank transport sector review mission analyzed the transport investments proposed under the Fifth Plan and attempted to identify the main policy and institutional issues impeding efficiency in the sector. The Transport Sector Issues Survey Report (No. 4423-KO dated December 27, 1983) concluded that, although most of the transport investments proposed under the Plan pursued development priorities which were appropriate, considerably more could be done to increase the productivity of existing facilities and equipment. With the increasingly complex traffic patterns and higher traffic densities, the growing requirements for maintenance of the expanded system, and the need to conserve energy, the mission foresaw an even greater need to maximize efficiency in this capital intensive sector. The report identified three main areas requiring specific attention in the

current, more demanding economic environment: (a) planning, (b) regulation and pricing, and (c) energy conservation. Bank-assisted projects currently under implementation are addressing these issues and progress so far is satisfactory.

1.13 In the port/shipping subsector, a number of specific sector reviews were carried out by the Bank to assist the Government in identifying measures to optimize the operational efficiency of the shipping fleet and to refine the investment strategy for major fishing and container ports. A Survey on the Prospects and Strategy for the Development of the Korean Shipping Industry, issued in January 1985, was carried out following recent Government-induced mergers of shipping companies (para. 2.04) to avoid major bankruptcies in the industry. The report assesses shipping routes and type of trade, makes suggestions on the focus of future development and proposes a strategy to consolidate or promote profitable activities and scale down obsolete ones, including scrapping old vessels. A Sector Report on Planning for Fishing Port Development was prepared in March 1986; it advises a consolidated approach to planning in order to concentrate development and improvement to few selected fishing ports with potential rather than to spread public investment in developing and expanding systematically most of the existing fishing ports. Another Sector Report on Container Port Site Selection and Regional Development, prepared in March 1986, compared the merits of alternative sites and concluded that locating container facilities elsewhere than Pusan would reduce its attraction to shipping lines as Korea's main hub port while having little effect in generating regional development at the main alternative site which was the Kwang-yang Bay area on the southeastern coast.

D. The Bank's Role in the Sector

1.14 The Bank's policy dialogue is being strengthened through the increasing emphasis on sector and subsector work directly linked to transport lending in Korea. This new approach was initiated in 1984 with a Highway Sector Project (Ln. 2392-KO) which helped to deepen and broaden the Bank's involvement in the road subsector by extending assistance to the Ministries of Construction (MOC), of Home Affairs (MOHA), of Transport (MOT) and of Energy and Resources (MOER). This project is providing a framework for these agencies to improve their planning and coordination and to conserve energy and somewhat deregulate land transport; preparation of a second highway subsector loan is underway. For railways, the Bank has traditionally made sector type loans, financing time slices of KNR's investment plans. The recently approved Seoul/Pusan Corridor Project (Ln. 2600-KO) continues this involvement for the duration of the 1982-86 Fifth Plan. For ports, Bank assistance has been directed at the modernization and expansion of facilities to support Korea's export-led development. Containerization was introduced at Pusan under two previous port projects (Lns. 917-KO and 1401-KO) and would be developed further under the proposed project. It would be another opportunity for the Bank to support government policy measures aimed at increasing the efficiency of container handling and further strengthening KMPA's progress in institution building, primarily to improve the management and finances of the port subsector.

1.15 Besides these subsector operations, the Bank is assisting the Government in developing multi-modal projects. The first was the Coal and Cement Distribution Project (Ln. 2267-KO) approved in 1983, involving railways, ports and inland terminals. This would be followed by projects directed toward increasing the capacity of the transport system in certain high priority areas and corridors. In particular, a multimodal transport study for the Kyonggi Region is underway to identify priorities in strengthening the expressway and suburban rail networks to meet the very high transport demand in the suburbs of Seoul. The complementarity of the various modes will be promoted by developing interconnecting terminals to optimize the use of this suburban transport network. Another multimodal transport study was carried out from 1983 to 1985 to review the feasibility of a high speed rail line in the Seoul-Pusan transport corridor. This study resulted in the 1985 Seoul-Pusan Corridor Project (Ln. 2600-KO) as a first step to increase rail capacity through an improved signalling system. Subsequent steps might include the construction of a high speed train that would run on a separate, dedicated track together with the related improvement of road transport to provide transport complementarity between rail and road. A third possible study now being suggested to Government could address the need to modernize the transport network in the southern coastal region to link Mokpo-Sunchon-Masan to Pusan-Ulsan-Pohang in the east, where most heavy industries are concentrated and Kwangju, the Cholla Nam Region capital, in the west. The study could include the feasibility of a new port at Kwang-yang Bay and of road and rail links to the hinterland.

E. Previous Bank-Assisted Projects in Transport

1.16 The Bank's past involvement in the transport sector has been substantial. Since 1962, the Bank Group assisted KNR through nine railway projects amounting to US$501 million, MOC and MOHA through six highway projects amounting to US$690 million and KMPA through two port projects amounting to US$147 million. KNR and KMPA were also assisted through a multimodal project amounting to US$122 million. Of these seventeen projects, thirteen have been completed. Project Completion Reports and Project Performance and Audit Reports have been issued on many projects which in general have been quite successful in upgrading transport infrastructure and strengthening the institutions in charge. Recent operations are concentrating on more intensive use of existing facilities, more efficient maintenance and on transport investment policies that seek to develop complementarity between the modes of transport.

1.17 The Bank has helped finance three projects in the ports subsector. A Project Performance Audit Report (No. 5756) was issued on the first two projects. The First Port Project (Ln. 917-KO) of June 27, 1973 provided US$80.0 million for development of coal and cement berths at Mukho port as well as for a two berth container terminal at Pusan and was satisfactorily completed in August 1979. The project also provided the framework for a reorganization of all Korean ports, the establishment of KMPA and extensive institution building. The Second Port Project (Ln. 1401-KO) of April 28, 1977 provided US$67.0 million for a 2-berth expansion to the container facility at Pusan and continued institution building within KMPA. Completion of the project in March 1983 enabled Pusan port (and Korea as a whole) to implement

an effective containerization program which attracts mainline ships, reduces handling costs and expedites the flow of cargo. The ongoing Coal and Cement Distribution Project (Ln. 2267-KO) of April 29, 1983 provided about US$21.6 million to improve the handling and distribution of coal at Inchon port. Implementation has been slow due to a declining demand for coal imports and this project component required to be redefined.

1.18 Lessons learned under the first and second port projects include the need for detailed operating plans for facilities created under the projects, and the need to better estimate the difficulty of implementing major institutional changes. The designs for two Action Plans included in the proposed project arose out of these lessons. For example, the further improvement of financial and management functions required to search for a better way to arrive at a consensus on institutional development plans and objectives and ways to implement them. Previously, institutional development objectives and matching target dates had been set without detailed analysis of the steps in the process needed to achieve them. This led to subsequent difficulties both in translating the objectives into specific tasks and in trying to gauge the steps required to complete the tasks; the result was a slow, difficult implementation experience. The proposed Plan attempts to rectify this by mapping out intermediate steps and actions required as well as ways for monitoring and guiding the process. Similarly, the current underutilization of the rail terminal, CY and CFS at Pusan led to the proposed container handling Action Plan which is aimed at defining clearly the steps and actions required for improving the rules and procedures now governing the usage of these facilities.

II. THE PORT AND SHIPPING SUBSECTOR

A. Traffic and Port Capacity

2.01 Korea's export-oriented industrialization policy coupled with its need to import raw materials with which it is poorly endowed have placed increasing demands on maritime transport. Port infrastructure and the vessel fleet have therefore been rapidly expanded, and Korea now has 46 general or commercial ports with 60.6 million metric tons (mt) of stevedoring capacity per year and 12 industrial ports with 52.1 million mt capacity. In addition, there are some 400 fishing ports and 1,400 other wharfs without basic facilities (Tables 2.1 and 2.2).

2.02 Total cargo movement, including seagoing and coastal freight, increased by 11.4% p.a. in the Third Plan (1972-76), 8.4% in the Fourth Plan (1977-81) and 8.1% during 1982-84, the first three years of the Fifth Plan. Seagoing freight traffic through Korean ports reached over 75 million metric tons (mt) in 1984 compared to 5.1 million mt in 1966, while coastal freight reached 37.8 million mt compared to 2.8 million mt over the same period, increasing respectively at 16.2% and 15.7% p.a. (Table 2.3). In 1984, the most important commodity shipped was petroleum representing about 30% of the total 114 million mt through Korean ports, followed by containers and break-bulk general cargo with 10% each, and by iron/steel, iron ore and cement with about 7% each (Table 2.4). These increases created serious port congestion. Both Pusan, the biggest port handling 30% of the country's external trade, and

Inchon, the port nearest Seoul, required urgent expansion, and a large containerization program was started. Industrial development on the east and south coasts prompted the creation of specialized ports at Pukpyong for cement, Pohang for steel mill input and output, Ulsan for refineries and petrochemicals, Onsan for a refinery and nonferrous metal industries, Changwon for industrial machinery and Samil (Yosu) for fertilizer and petrochemicals (Table 2.5).

2.03 In spite of these recent developments, further efforts are required to expand port capacities and to improve port handling operations which remain costly for some cargo categories at certain ports. In 1984, the ports' capacities, measured by the stevedoring throughput of each port, showed an aggregate deficit of 12.0 million mt, comprising a 22.4 million mt net deficit for general ports and a 10.4 million mt surplus for industrial ports. One half of the general ports' capacity shortage is concentrated in Pusan. To make up for the present deficit, lightering and labor-intensive cargo handling methods are used. The situation has improved with the completion, in 1983, of the Pusan port's second phase expansion, financed by the Bank under the Second Port Project (Ln. 1401-KO), and the expansion of Inchon port financed by the Asian Development Bank (ADB).

B. Maritime Transport and the Fleet

2.04 Korea's shipping industry has expanded very fast and is becoming a major foreign exchange earner which the Government wants to develop further. However, the financial results for most companies have been poor because of low and declining shipping tariffs, brought about by sharp competition and more efficient ships. In 1984, the Government initiated a massive merger of 68 shipping companies into 20 in an attempt to avoid a series of bankruptcies which would have been a severe blow to a dynamic but somewhat inexperienced industry. The Bank has provided assistance to Korea in analyzing the prospects and proposing a strategy to return the industry to a sound footing (para. 1.13). In 1984, with a tonnage of 6.5 million gross registered tons (GRT) including 0.3 million GRT of coastal vessels, the fleet ranked fifteenth in the world. Annual receipts from ocean freight increased from US$425 million in 1976 to US$2.3 billion in 1984 or about 9% of the country's foreign exchange receipts; meanwhile, Korea's flagships increased their share of total national ocean cargo from 39% in 1976 to 50% in 1980, a share maintained until now. This is particularly high; in comparison, Japanese vessels carried about 40% of Japan's imports and 23% of exports in 1981.

2.05 In 1984, the coastal shipping fleet numbered 513 ships, totaling 320,000 GRT, and varying in size from less than 100 to over 10,000 GRT. Coastal shipping has an important role to play as Korea's cheapest domestic transport. In 1984, it moved 27% of bulk traffic compared to 10% in 1966. This traffic consisted mainly of coal, cement and oil. Cargo movement grew at 7.2% p.a. from 4.6 billion ton-km in 1971 to 10.6 in 1983.

C. Port and Shipping Development Plans

2.06 The expansion of Korea's foreign trade and coastal shipping will continue to require major increases in its vessel fleet, port facilities and

trained seamen. Forecasts prepared by KMPA for seagoing traffic assume an 8.2% p.a. growth over the Fifth Plan period, only slightly higher than the 7.5% expected annual GNP growth, and 7.2% over the Sixth Plan. This compares to the 12% to 16% p.a. growth rates recorded in the 1970s.

2.07 To cope with the expected traffic growth, policy directions under the FFYP emphasized the need to:

(a) increase the fleet size and strengthen Korean shipping business to maintain or raise its 50% share of the transport market for exported goods;

(b) intensify cooperation with other major world shipping lines to develop new routes and container services;

(c) promote coastal shipping to improve access to isolated islands and to increase coastal freight transport;

(d) modernize and expand port facilities and promote operational efficiency; and

(e) develop training to raise the quality and availability of seamen.

2.08 To support these objectives, an investment program of W 2,655 billion (US$4.3 billion) was recommended under the FFYP, including US$1.6 billion in foreign currency. Some W 2,080 billion or 80% were to be invested by the private sector, primarily for ships, and W 578 billion by the Government, mainly for port construction and improvement, maintenance and dredging, and for training institutes. The development plan for the general and industrial ports was to increase capacity from 95 million mt in 1982 to about 124 mt by end 1986. The Fifth Plan, however, was revised in end-1983 to account for the slower economic activity, and investments planned by KMPA were reduced by about W 100 billion over the plan by extending construction periods and changing priorities. MOC and National Fisheries Administration (NFA) investments were also trimmed.

2.09 The main port investments now being implemented are for Inchon port, amounting to some W 153 billion, including US$64 million in foreign exchange being financed by ADB. A further W 43 billion, including US$21 million in foreign exchange financed by the Bank under the Coal and Cement Distribution Project (Ln. 2267-KO), are allocated to construct a coal terminal outside the port. Inchon is expected to handle more container traffic because of the capacity constraints at Pusan after 1986 when all container piers there will be fully used. In addition, a number of small projects are being carried out including construction of small breakwaters, terminals, and access roads for Kunsan, Wando and Sokcho. Developments at Mokpo, Cheju and the Pusan Third Phase Container Port scheduled in the FFYP were postponed until 1986, the last year of the plan.

2.10 In line with government policies to diversify energy sources, piers for coal imports are being built at Inchon and Mokpo, and a central coal terminal station (CTS) is being built at Kwang-Yang Bay to supply local and indus-

trial users who began switching to coal as their fuel source. Other industrial ports were completed by MOC at Pohang, Changwon and Pyongtaek (Asan).

2.11 A number of programs are expected to improve port management and the financial strength and efficiency of shipping firms. These include (a) the establishment of a Shipping Development Fund; (b) port management improvements and (c) training of seamen and officers to increase their skill and availability for Korea's larger and more modern fleet.

D. Port Organization

2.12 Responsibility for the administration and development of ports is shared among four ministries -- MOT, MOC, MOHA and the Ministry of Agriculture (MOA). MOT's Korea Maritime and Port Administration (KMPA), created in March 1976, is responsible for the planning, construction and operation of Korea's 24 first-class commercial ports through ten District Maritime and Port Authorities (DMPA) which are responsible for day-to-day operations at the ports. The largest is the Pusan District Maritime and Port Authority (PDMPA). KMPA is also responsible for planning and developing the 22 second-class commercial ports although their operations and maintenance, as well as that of numerous other small local ports, are handled by provincial governments under MOHA. Fishing ports are under the responsibility of the NFA of the MOA.

2.13 MOC is responsible for the planning and construction of industrial ports, which are defined as those being part of industrial complexes. Once built, industrial ports are turned over to KMPA, but only for maintenance and partial operation, since the management and cargo handling generally remains with the administrators of the industrial complex. This division of responsibilities may have appeared reasonable at the time of the reorganization in 1976, but it sometimes conflicts with KMPA's responsibility for overall port planning. The Government moved to avoid this conflict by agreeing to establish an Inter-Ministerial Committee under the chairmanship of the Vice-Minister of the Economic Planning Board (EPB) to review MOC's proposals for industrial port development, and to take action as required. This has led to increased consultation on port expansion programs between KMPA and MOC.

2.14 KMPA is a public administration owned and controlled by Government but its role and functions have been carefully designed to allow a substantial role for the private sector as well. While KMPA provides the public port infrastructure to meet the shipping needs and collects direct revenues from port users, it leaves, in most instances, to private port terminal operating companies and stevedoring operators the functions to handle and store the cargoes on piers and warehouses that are leased to them. Port handling equipment is usually privately owned. This distribution of functions enable maintaining a high level of efficiency in cargo handling as it is essentially an all private operation; it also facilitate the mobilization of resources for port development that are more easily secured by the public sector. The present organization is satisfactory as it allows a useful combination of public and private resources and enable the flexibility to adjust to changes in demand.

E. Management, Staff and Training

2.15 KMPA is headed by an Administrator who is appointed directly by the President of Korea and has the rank equivalent to a Vice Minister (Chart 1). KMPA has gained valuable experience in port development, management and administration in the course of several previous port development projects, some of which have been assisted by the Bank, the ADB and the Saudi Fund. Existing management and staff are thefore considered to be capable of implementing the proposed project.

2.16 KMPA's present staff totals 1,900, including 400 at headquarters and 1,500 at various regional offices. Of the total staff, about 1,000 are technical and 510 are administrative, the rest are operators and others. There is currently a need to strengthen certain functions, especially the capability to undertake the more complex aspects of port investment and master planning. Both planning and project appraisal are now done on an ad hoc basis through the use of consultants and other special arrangements. KMPA needs to develop its in-house capabilities, probably by strengthening its planning unit. Extensive use can also be made of its research body, the Korea Maritime Institute (KMI) created in 1984, in developing this capability. The proposed project addresses this need by including a training component for port planners and managers (para 4.02 and Annex 4). Assurances were obtained during negotiations that KMPA will carry out the training program for port planners and managers according to a schedule agreed with the Bank.

2.17 Staff training in operation, maintenance, finance and accounting was provided under two previous Bank-assisted projects (Lns. 917 and 1401-KO), but this was just a start in meeting KMPA's need for financial and accounting staff since KMPA had no such staff in the early 1980s. Before then, only administrative accounting methods were used. Under the proposed project, training in accounting, finance and modern management would be also provided (para. 2.21).

F. Port Operations and Maintenance

2.18 The DMPAs are nominally responsible for cargo handling operations at the ports but it is the numerous private Terminal Operating Companies (TOC) who do the actual loading/unloading. The DMPAs therefore have a largely supervisory and coordinating role in operations. The use of TOCs resulted from the recommendations of a study financed under Loan 917-KO. At PDMPA, there are several TOCs which operate at the grain, general cargo, bulk cargo and container piers. The largest one, the Pusan Container Terminal Operating Company (PCTOC), is government-owned. As most lifting equipment is privately owned, port maintenance carried out by the DMPAs is limited to civil works and the dredging of access channels. This is carried out satisfactorily.

G. Financial Objectives, Tariffs and Costs

2.19 KMPA's basic financial objectives are to develop as a more commercial and efficient entity so as to keep recovering its costs, including serving its debt and to yield a reasonable overall rate of return. KMPA has actively pursued this objective and in doing so has complied with the major

covenants in loan agreements signed with the Bank regarding commercial accounting, periodic fixed assets revaluation, earning the required rate of return on net fixed assets in use, and the establishment of well-run terminal operating companies at certain ports. It was previously felt that an autonomous KMPA could more easily meet the financial objectives, but this is not the only way. In response to a government request, the Bank agreed in 1985 to a provision requiring KMPA to have satisfactory commercial budgets, accounts and records in place of its earlier obligation to vest KMPA with legal autonomy. To implement the earlier obligation concerning autonomy, KMPA would have had to be placed under the Commercial Budgeting and Accounting Law. Submission to this law would have prevented KMPA from receiving government contributions even for the carrying out of its (mandatory) nonrevenue generating obligations. This would have seriously impaired KMPA's functioning, as the Government has assigned it major responsibilities for maritime affairs and for Second Class Ports.

2.20 Tariffs for various port services such as pilotage, dockage, etc. are determined by KMPA in consultation with the EPB, whereas those for stevedorage are largely set by market forces. The large profitable ports including Pusan and Inchon are subsidizing the other smaller ports. Few tariffs are cost based, but they are adjusted to cover inflation. The achievement of cost based tariffs was one of the objectives of the Second Port Project. KMPA did some studies and initial designs for them but could not complete nor implement them by the time of loan closing. In retrospect, cost based tariffs could not have been implemented without an appropriate financial and cost accounting system being first developed in KMPA. However, port tariffs are currently high enough to generate sufficient revenue for KMPA to meet its rate of return target and also notionally to cover debt service and contribute to investments. Assurances were obtained at negotiations that KMPA and PDMPA will take all necessary measures including to keep tariffs at appropriate levels to enable them maintain their target rates of return of 5% and 7% respectively on net fixed assets in use.

2.21 KMPA realizes that it needs a framework for translating these and other objectives into specific actions or tasks as well as to monitor, periodically redefine, and sharpen their focus. Hence, KMPA has designed and intends to implement an Action Plan (Annex 6) which is fairly comprehensive in nature. The implementation of this Action Plan from 1986 to 1995 will help to fulfill KMPA's objectives as well as ensure full compliance with obligations under Bank loans, including the loan proposed now. It includes (a) computerizing the commercial accounting system, (b) designing a cost accounting system and implementing it; and (c) computerizing the port operations system as a first step to introducing a comprehensive management information system. Each component was designed to improve the capabilities of KMPA in particularly through training in specific areas, as well as to develop it as a more market oriented institution which would be responsive to changes in its economic environment. Hence, completing the commercial accounting component of the plan will enable the preparation and timely delivery of financial information to management throughout the KMPA network. Similarly, data from the cost accounting system will be useful for planning and marketing port services. Lastly, the development of a modern management information system will enhance the managerial control and efficiency of KMPA. Taken together, implementation

of these components is essential to the proper management of KMPA's resources and supports its development strategy. Hence, the plan will help promote the development of KMPA as an efficient organization, whatever its future status as a government agency or not might be.

2.22 The Action Plan will at first be implemented on a pilot basis at PCTOC because it is an appropriate unit for testing changes. This would also complement ongoing efforts by PCTOC management to analyze its traffic patterns and users' preference in order to better price its services. Pilot implementation would include: (i) restating PCTOC's books to reflect the full cost of all assets in use at the terminal and the setting up of proper cost centers; (ii) introducing manual cost accounting procedures and subsequently computerizing them, and (iii) developing a computerized management information system. As the pilot program progresses, PCTOC management will be given greater freedom to respond to changing market conditions in order to optimize the use of its facilities. Once successfully implemented, the pilot program will be expanded to all other terminals at Pusan and then afterward, to all of KMPA. At negotiations, the draft Action Plan to improve financial and managerial functions was further refined and finalized. KMPA has agreed to the final plan (under cover of a letter from the KMPA Administrator). While adherence to the objectives of the Action Plan is necessary, annual progress reviews would enable updating targets in consultation with the Bank.

H. Budget, Accounting and Audit

2.23 Port budgets are prepared at KMPA headquarters using information from individual port managements. The annual budget is allocated directly to KMPA by the Economic Planning Board. Being organized under the Government Invested Enterprises Act and related rules, KMPA is subject to the supervisory control of the Minister of Transport. Also, port operating revenue is regarded as part of the general government revenue and port operating costs plus funds for investments are provided from the Government's budget.

2.24 KMPA uses standard government administrative-type accounting but under Ln. 1401-KO an alternative commercial accounting system was designed to replace it. However, KMPA, under instructions of the Minister of Transport, is implementing the commercial accounting system in parallel with its normal administrative accounting (para. 2.19).

2.25 The National Board of Audit and Inspections (NBA), which reports directly to the President, inspects KMPA's overall accounts. In addition, the commercial accounts are audited in accordance with generally accepted principles by independent auditors. Assurances were obtained during negotiations that Government will cause KMPA to have its accounts and those of PDMPA, audited by independent auditors acceptable to the Bank and that the reports will be furnished to the Bank within eight (8) months after the end of each fiscal year.

III. PUSAN PORT

A. Organization and Staffing

3.01 Pusan Port is managed by the Pusan District Maritime and Port Authority (PDMPA) which is under the direct control of KMPA. PDMPA is composed of six administrative divisions (Chart 2) and two operating bodies: the Pusan Port Construction Office (PPCO), which is responsible for the design and implementation of the proposed project and the Pusan Container Terminal Operating Company (PCTOC), which is responsible for operating the container terminal at piers 5 and 6. PDMPA is headed by a Director General who reports directly to KMPA's Deputy Administrator; PPCO is also headed by a Director General who reports both to PDMPA's Director General and to KMPA's Director General, Construction and Development Bureau; PCTOC is headed by a President who reports to PDMPA's Director General and KMPA's Director General, Port Operations Bureau. The management of the port is satisfactory.

3.02 PDMPA employs about 1,200 persons including about 80 in the PPCO, and 540 in PCTOC. Private operating companies (stevedores) are contracted directly by ship agents for loading/unloading operations (para. 3.07).

B. Existing Facilities

3.03 Pusan Port is situated on the southeast corner of the Korean peninsula (Map IBRD 19536). Water depths within the harbor vary from 5 to 13.5 meters, with 9-10 meters available at most berths and 12.5 meters at the grain and container berths. Tides are semidiurnal with a range of about 1.3 meters. Total length of the quaywall is 8,600 meters, sufficient to provide more than 40 berths for ships, barges, lighters and service boats (Table 3.1). Containers are handled at piers Nos. 5 and 6 which are specialized for handling containers and also at the general cargo piers Nos. 1 to 4. Pusan's port capacity has been progressively expanded from 2.5 million mt in 1962 to 15 million mt in 1981 and 31 million mt in 1983. This last expansion, partly financed under Ln. 1401-KO, consisted of a two berth addition to the container pier No. 5 and rehabilitation of general cargo berths.

3.04 The port is served by a double-track railway line to Seoul and has special container loading facilities in PCTOC. Also, it is connected by the Seoul-Pusan expressway and other highways to the neighboring provinces. Both railway and highway connections are adequate. Water supply, sewage disposal and telecommunications are also adequate.

3.05 The inner harbor is protected by two breakwaters of about 1,350 meters in length, which is completely utilized. The navigation channel leading to the port has 13.5 meters depth below datum (MLW).

3.06 Approximately five kilometers south of Pusan port lies Gamchon Bay (Map IBRD 19232) which is being developed along lines laid down in a 1979 master plan as a subsidiary port to Pusan. Gamchon Bay will gradually take over a large part of the handling of bulk cargo traffic such as scrap iron, grain, coal and cement as well as marine related industries like ship building and repair work and a deep-sea fishery base. Several such installations are

already located on the bay including a steel mill, a coal-fired power generating plant, ship yards and a cement factory. The Government is now completing with its own funds a 500 meter long breakwater near the east side of the entrance to the bay. It has recently received a Saudi Fund loan of US$35 million to assist in construction of the 650 meter west breakwater.

C. Operations

3.07 Pusan port operates 24 hours a day. General cargo traffic is handled mainly at piers Nos. 1 to 4. Average 1978-84 productivity reached 225 tons per gang for an 8-hour shift. This is equivalent to over 28 tons per gang hour, which is high even in comparison with ports in most developed countries. For containers, PCTOC is the sole authority responsible for overall control and operation of the terminal, including marshalling, stevedoring, storage, delivery and handling of container freight. Creation of PCTOC was a good decision, and its management and operations are, in general, satisfactory with exception of low utilization rates in the container freight station (CFS) and the container yard (CY) (para. 3.11). Pending further studies, it has not yet been decided if PCTOC will manage the new container pier to be built under the proposed project or if a separate TOC will be established. This will be done as part of an Action Plan to improve the handling of containers (para. 3.13). Under the proposed Action Plan KMPA will have a study carried out to compare the merits of the various alternatives for managing the proposed terminal in accordance with terms of reference and schedule to be agreed with the Bank.

D. Pusan as Korea's Hub Container Port

3.08 Pusan is Korea's largest port. Its expansion has supported the ongoing industrialization of the country and in particular, the necessary imports of raw materials and industrial goods and the exports of manufactured products. In line with the modernization of the shipping industry, the containerization of part of the imports and of an even larger part of the exports, has taken place very rapidly (Table 3.2). The ever increasing competition in shipping has led to the introduction of the third generation container ships with capacity of 3,500-4,000 units that require a further concentration of container handling at fewer, well equipped hub-ports from which feeder vessels serve secondary ports. As present container traffic at Pusan is reaching existing capacity, and the alternative port of Inchon, closer to Seoul, is not suitable in the new economic environment due to its remote location. The proposed further expansion of Pusan in the outer port appears the most rational solution. Not only will it offer scope for more expansion in the future, but it will also maintain the attractiveness of Pusan as a hub container port in the pacific rim nations.

3.09 A number of alternative sites to locate further container facilities have been investigated under the Phase III Port Development Study carried out in 1982 by Consultants, Lyons Associates (USA) and Korea Engineering Consultants Company, who recommended Pusan as the most suitable location. Another more recent study, carried out by Kiri-Sekwang Consultants (Korea), concurred with the suitability to proceed with the proposed three berths in Pusan outer harbor but recommended that future expansion take place at Kwang-yang Bay,

some 150 km West of Pusan, on Korea's south coast. These findings were reexamined by the Bank in a recent Sector Report (para. 1.13) which concluded that there is no merit to plan for a future hub container port other than at Pusan, although there is scope for secondary container ports such as Inchon or Kwang-yang Bay to accommodate feeder vessels to and from Pusan. The Sector Report will soon be sent for review to the Government and it is expected that its findings will be taken into account in the preparation of the Sixth Five-Year Development Plan. This issue was discussed during negotiations and it was agreed that in formulating its future plans for container port development, the Government would take into consideration the existing facilities and proposed investments at Pusan Port.

E. Proposed Port Development

3.10 As Pusan's port already handles most of the national container traffic, its best role is to concentrate on handling containers as Korea's hub port. This means developing more facilities by opening the outer harbor area while diverting some of the polluting dry bulk cargo to other subsidiary facilities to be developed in nearby Gamchon Bay and elsewhere. The selected site for the new container terminal is relatively costly to develop because it is outside the existing protected inner harbor area and new breakwaters are therefore required. Expansion within the existing inner harbor at Pusan was considered but no suitable sites are available as it is hemmed in by the city and steep hills, and all sites around the eight square kilometers of water are already fully utilized. The role and functions of the different port areas such as the inner and outer ports and Gamchon Bay will have to be revalued to determine optimal utilization. The proposed project will require updating of the Pusan Port Master Plan. Assurances were obtained at negotiations that the port's Master Plan will be updated according to terms of reference and timing agreed with the Bank.

F. Inland Container Handling Operations

3.11 Container handling operations in Korea are generally effective and relatively economic, especially in the loading and discharge of container ships. Most container storage, stuffing and stripping in Pusan is done in 32 off-dock container yards, aggregating to more than one million sq m of storage area (Table 3.3), but the use of these facilities contributes to serious traffic congestion in the city. At the same time, PCTOC's facilities, with one third of this area, are used at about 25% of capacity. Much should be done to improve the rules and service offered by PCTOC's existing container storage, stuffing and stripping facilities to keep more of this traffic in Pusan Port. For example, although the major part of the container yard is operated with transtainers capable of stacking containers four high, current practice is to stack them not more than two high. Also, containers shipped on non-Korean vessels are not allowed to be stored in PCTOC facilities for custom clearances.

3.12 Because Korea's container trade is highly unbalanced (13.6 mt of containerized exports versus only 6.25 mt of containerized imports) there is a need to maintain a stock of some 25,000 TEU or about 15 days of export requirements, which cannot be all accommodated on-dock (Tables 3.4 and 3.5).

Inland transportation is well developed, and highways are the main means used to distribute containers inland. About 70% of the total container traffic through Pusan have other destinations, including Seoul area where 40% of the traffic is bound (Table 3.6). The railway (KNR) has recently opened a "dry port" container terminal at Pugok near Seoul, but so far only about 22% of the Seoul-Pusan traffic moves by rail, considerably less than should be the case, given relative costs (Table 3.7). This underutilization of the railway results in unnecessarily high inland transport cost to shippers, adds to traffic congestion and requires MOC to expand the highway network.

3.13 To improve the situation and to deal with the problems described in paras. 3.11-3.12, the Government has agreed in principle to a draft Plan of Action for the Improvement of Korea's Inland Container Handling Operations which is to be implemented as part of the proposed project (Annex 7). The Plan's main objectives are to increase the throughput capacity of existing container facilities, plan for the organization and management of proposed new facilities, and to increase the role of the railways as a more economic mode to handle containers on long distance. The plan thus provides for planning and taking action in several areas, including measures to improve throughput prior to the availability of the new installations. Measures would be taken in particular to improve container rail service and frequency on the Seoul-Pusan line and to integrate the operations of the Pugok rail terminal with the port container terminals. Timely action would be taken to set up an organization to operate the new outer harbor container terminal and to design and establish a business oriented organization to manage port and rail container services and to market them to users. The execution of the plan would be supervised by a steering committee composed of senior representatives of KMPA, KNR and the City of Pusan and chaired by a representative of the Ministry of Transportation (para. 4.03). At negotiations, the draft Action Plan to improve container handling was further refined and finalized. KMPA and KNR have approved the final plan (under cover of a joint letter from their Administrators). While adherence to the objectives of the Action Plan is necessary, annual reviews would enable updating targets in consultation with the Bank. Under the Action Plan KMPA will have a study carried out for the consolidation of Pusan's off-dock CYs in the proposed Dong Myung area and KNR will have a study carried out to increase throughput of container trains to accommodate traffic requirement by 1990 when the outer port starts operation.

IV. THE PROJECT

A. Objectives

4.01 The objectives of the proposed project are:

(a) to provide installations and equipment in the Port of Pusan for efficient handling of the import and export of container traffic;

(b) to reduce congestion in the city of Pusan by providing sufficient container stacking space in the port area to largely eliminate the need for off-dock container storage in the Pusan area;

(c) to increase the efficiency of existing and proposed port container handling facilities and of the inland container transportation system. This last objective is already part of KNR's objective under the ongoing Seoul-Pusan Corridor Project (Ln. 2600-KO) which provides funds to better utilize the railways for passenger and freight; the proposed project spells out how KNR will improve container services and use the Pugok rail container terminal as a "dry port" for Seoul area; and

(d) to improve further KMPA's and PCTOC's management and financial control over ports activities.

B. Project Description

4.02 The proposed project would consist of the following major items:

(a) Civil works

- 1,704 linear meters of breakwater, a 3-berth container terminal with appropriate back-up storage, facilities and utilities, and road and rail access to the terminal;

(b) Equipment

- 6 container gantry cranes, 20 container transfer cranes, 34 yard tractors, 100 yard chassis for 20 and 40 foot containers, and forklift trucks;

(c) Railways component (Annex 3)

- Equipment for rail car brake systems, rear-train monitors, container locking devices, adding tracks and a transtainer at PCTOC's container yard, and a study to increase KNR's long-term capacity to handle containers;

(d) Technical assistance (Annex 4) to:

(i) train port planners and managers;

(ii) study and implement measures to improve financial management including development of a management information system and computerized accounting;

(iii) update the Master Plan for Pusan port taking into consideration the new developments at Gamchon Bay and the city;

(iv) carry out studies to (a) improve container operations and utilization of existing container yard and CFS at PCTOC piers 5 and 6, (b) plan, design and implement the T-junction to the expressway, (c) relocate off-dock CYs in Pusan area to the Dong Myung on-dock proposed CY, (d) improve container distribution systems throughout Korea, and (e) define management organiza-

tion and operating rules for the proposed container terminal; and

(v) supervise civil works and erection of equipment.

4.03 As part of the project, the Government was requested at negotiations to confirm that it will undertake the introduction of a number of policy measures that were described in two draft Action Plans. The two Plans were finalized during negotiations and have been sent to the Bank with a covering letter from KMPA and KNR (Annex 5) which outlines the agencies' agreement to implement specific actions in accordance with a proposed schedule. One Plan deals with the strenghtening of KMPA's financial and managerial functions (Annex 6) and the other Plan deals with the rationalization of container cargo handling and distribution throughout Korea (Annex 7). The plans were prepared by Government Agencies concerned including KMPA, KNR, City of Pusan and MOT, in close cooperation with the Bank. The technical assistance part of the project (para. 4.02 and Annex 4) provides the scope for the studies and funds to carry them out.

4.04 Progress reports would be issued twice a year, the first two in October 1986, for both the Financial and Managerial and the Inland Container Handling Action Plans, respectively by KMPA's Finance Bureau and by the steering committee chaired by MOT, through its Transport Coordination Bureau acting as its secretariat. Indices for monitoring progress are included in each of the Action Plans. Progress under each Plan would be discussed through progress reviews to be held semiannually, but one of the reviews would be more detailed and focus on any need for updating targets of the Action Plans. Assurances were obtained at negotiations that once a year, a detailed review of the Action Plans will be held by KMPA, KNR and other parties concerned with a view to update targets if and when necessary. Any proposed adjustment in targets would be made available to the Bank for review and comments.

C. Cost Estimates

4.05 Cost estimates for civil works are based on detailed engineering and unit prices for ongoing similar works in Korea. Equipment costs are based on prices as of January 1986 for similar equipment purchased in Korea and in other Bank-financed projects. The estimated total cost of the proposed project is W 295 billion or US$328 million equivalent inclusive of taxes and duties. Of this amount about 57%, W 168 billion or US$187.0 million equivalent, would be in foreign exchange. Physical contingencies are included at 5% of the base costs; price contingencies are based on foreign cost increases of 7.0% in 1986, 7.0% in 1987, 7.5% in 1988, 7.7% in 1989 and 7.6% in 1990, local cost increases of 5% in 1986 and 5.5% thereafter until 1990. Further details are given in Tables 4.1, 4.2 and 4.3 and summarized below.

Summary of Cost Estimates

	Won millions			US$ '000			Loan (US$ '000)	Loan as % of total
	Local	Foreign	Total	Local	Foreign	Total		
Civil works	91,715	112,069	203,784	101,905	124,523	226,428	115,895	51.2
Equipment	1,702	21,229	22,931	1,892	23,588	25,480	23,588	92.6
Subtotal	93,417	133,298	226,715	103,797	148,111	251,908	139,483	55.3
Technical assistance and training	2,679	1,133	3,812	2,975	1,260	4,235	1,260	30.0
Value added tax and customs duties	11,756	-	11,756	13,061	-	13,061	-	-
Total base cost	107,852	134,430	242,282	119,833	149,370	269,203	140,743	52.3
Physical contingencies	4,805	6,722	11,527	5,339	7,469	12,807	-	-
Price contingencies	14,541	27,109	41,650	16,158	30,124	46,282	-	-
Subtotal	19,340	33,831	53,177	21,497	37,593	59,089	-	-
Grand Total	127,198	168,261	294,459	141,330	186,963	328,292	140,743	42.8

The KNR component to be financed from Loan 2600-KO, is estimated at W 3.6 billion or US$4 million, including US$3 million in foreign exchange. The cost of the technical assistance and training amounts to W 3.8 billion or US$4.2 million equivalent of which the foreign exchange is about W 1.1 billion or US$1.3 million. 170 man-months of consultants' assistance will be used for the operational study, the updating of Pusan Port Master plan and for construction supervision. The balance of the technical assistance consists of training (Annex 4).

D. Financing

4.06 The Government has requested the Bank to finance $141 million of the foreign exchange component of the proposed project, while it will finance directly the whole balance of the foreign cost for contingencies estimated at US$37.5 million and construction start-up work, estimated to cost US$8.5 million in foreign exchange. All local funds required for the project would be furnished by the Government. The financing plan is summarized as follows:

SUMMARY OF FINANCING PLAN
US$ million

Source of Finance	Local	Foreign	Total
Proposed Bank loan	-	141.0	141.0
Government	141.3	46.0	187.3
Total	141.3	187.0	328.3

The financing plan was reviewed during negotiations and the government contribution was confirmed. The Bank loan will be made to the Government and the proceeds will be onlent by the Government to KMPA through a subsidiary loan agreement at the same interest and at the same terms as the Bank Loan. The signing of a Subsidiary Loan Agreement will be a condition of loan effectiveness.

E. Implementation

4.07 The project will be carried out by KMPA with the assistance of consultants. KMPA executed the Second Port Project (Loan 1401-KO) in 1979 to 1983 utilizing its Pusan Port Construction Office (PPCO) which is also directly responsible for this project. Final engineering for the project has been satisfactorily completed by PPCO with the assistance of consultants. Supervision of construction will also be carried out by PPCO with the assistance of local consultants reinforced by some 100 man-months of foreign expertise. A Project Implementation Schedule is in Chart 3.

F. Procurement

4.08 Except for the start-up work, all civil works and equipment would be procured through International Competitive Bidding (ICB) in accordance with Bank guidelines. Prequalification will be required for civil works contracts. The works to be contracted separately, using local bidding procedures, would be a reclaimed area on which the concrete caissons for the breakwater would be built. As in the past, the Office of Supply (OSROK) will manage the procurement process. A listing of proposed types of procurement is as follows:

PROPOSED PROCUREMENT ARRANGEMENTS
(US$ millions)

Item	ICB	LCB	Other	Total
A. Civil works	272.3 (116.0) /a	11.1 (-)		283.4 (116.0)
B. Equipment	40.3 (23.7)			40.3 (30.2)
C. Technical assistance and training			4.6 (1.3)	4.6 (1.3)
Total	312.6 (139.7)	11.1 (-)	14.6 (1.3)	328.3 (141.0)

/a Figures in parentheses represent the amounts financed by the proposed loan.

4.09 Civil works procured through ICB will be grouped in three packages viz: South Breakwater (US$59 million), North Breakwater (US$81 million), and the container terminal (US$132.3). The inclusion of the CFS in this last package will be decided in 1988, and depends on the growth of demand for this type of service. Equipment procured through ICB will be grouped in packages according to type of equipment. For bid evaluation, Korean manufacturers will be allowed a margin of preference of 15% of CIF costs of competing imports or the relevant prevailing customs duties, whichever is lower. All the civil works and equipment contracts procured under ICB will be subject to prior review by the Bank.

4.10 Technical assistance will be provided to KMPA and PPCO for project supervision, for improvement of financial management and container operations, and for studies of traffic congestion in Pusan. Local consultants will be utilized whenever qualified personnel are available, but it is anticipated that some foreign experts will also be required. During negotiations, assurances were obtained that KMPA will select consultants in accordance to Bank's guidelines and submit draft terms of reference and contracts for review by the Bank.

G. Status of Preparation

4.11 Except for the road and rail access, rights of way for which are being furnished by the city of Pusan (construction is to start in January 1987), the project is to be built on land and water areas already under the control of KMPA. Prequalification invitations and procurement notices have been prepared by KMPA and issued after being reviewed by the Bank. Tender documents have been satisfactorily revised by KMPA along Bank's comments. Terms of reference and draft contract for engaging consultants for supervision of construction will be prepared by KMPA and submitted to the Bank for approval so that the consultants can be in place by the start of construction.

H. Disbursement

4.12 Disbursements would be made on the following basis:

(a) 55% of total expenditures for civil works excluding customs duties and taxes, which is equivalent to the estimated foreign exchange component;

(b) 100% of foreign exchange expenditures for directly imported equipment;

(c) 100% of local expenditures (ex-factory prices) for locally manufactured equipment procured on the basis of international competitive bidding;

(d) 100% of the cost of foreign consulting services; and

(e) 100% of the cost of overseas training.

4.13 Disbursements for studies, overseas training and for equipment and civil works contracts costing less than $1 million equivalent each would be made on the basis of Statements of Expenditure (SOEs). Disbursement for consultant services, civil works and equipment contracts costing more than US$1.0 million each would be fully documented. To facilitate disbursements a revolving fund would be established with an initial deposit of $10 million equivalent to about four months of expected expenditures. Documents supporting the SOEs would not be submitted to the Bank but would be kept by the project executing agencies and made available for review by Bank Supervision missions. Bank disbursements are expected to be completed by December 1991. Estimated quarterly schedule of disbursements is given in Table 4.4. It is based on the Project Implementation Schedule (Chart 3). In keeping with experience under previous port projects in Korea, it is faster than the standard regional transportation disbursement profile by one year. Any savings under the loan would be cancelled unless otherwise agreed with the Bank.

I. Environmental Impact

4.14 A substantial part of the proposed project will be built on lands already used for port and industrial purposes but there will also be a conversion of some undeveloped hills and shores near the harbor mouth into port related installations. In the interest of minimizing degradation of the appearance of the harbor entrance, it has been agreed that the contractors will not be permitted to quarry stone (for the breakwaters and revetment) in this area.

J. Project Evaluation, Monitoring and Completion Report

4.15 Project evaluation and monitoring would be performed by PPCO assisted by consultants as necessary. Progress under each Action Plan would be monitored respectively by KMPA's Finance Bureau and the steering committee chaired by MOT's Transport Coordination Bureau. Progress reports would be prepared every six months and be submitted to the Bank within one month thereafter.

4.16 Promptly after completion of the project, KMPA will prepare and furnish to the Bank a report on the execution and initial operation of the project, its costs and the benefits derived and to be derived from it.

V. ECONOMIC EVALUATION

A. Present and Future Traffic

5.01 Traffic at Pusan has been growing rapidly, averaging 8.6% p.a. since 1980. In 1984, the port handled 35.7 million revenue tons (mrt) of which 29.8 mrt was foreign trade and 5.9 mrt was domestic cargo. General cargo accounts for 59% of all traffic and 90% of it is containerized. Two thirds of the general cargo is outbound reflecting the trade pattern of Korea as an exporter of manufactured goods. Incoming traffic consist of bulk commodities such as iron, steel and scrap, grain and timber as imports and petroleum products, cement and coal as domestic trade. Details are in Table 5.1.

5.02 Containerized cargo has grown more rapidly than other cargo, at an average rate of 13% p.a. between 1976 and 1984 (Table 3.2). In 1984, Pusan handled 1,054,000 TEU, over 90% of all Korea's container movements, with Inchon accommodating the balance. At Pusan, about 58% of the containers are outbound. Both inbound and outbound movements have 20% empties; the inbound empties compensate for Korea's trade imbalance while the export empties are mostly new containers manufactured in Korea (Tables 3.4 and 3.5). Some 38% of the container traffic at Pusan is originating in, or bound to, Seoul greater metropolitan area and another 32% to other areas outside Pusan Region. The railways handle only 22% of the traffic between Pusan and Seoul and the balance is routed by trucks.

5.03 Future traffic. Recent traffic forecasts originate from KMPA and the Kiri-Sekwang study for Container Terminal Site Location. These forecasts respectively expressed in revenue tons and in metric tons are shown in Tables 5.1 and 5.2. The growth rates used for the economic evaluation are given in Table 5.3 and summarized below.

Pusan Traffic Growth Rate Forecasts (% p.a.)

	General Cargo	Containers	GNP
1986-91	7.5	8.5	6.5
1991-96	7.0	7.0	6.0
1996-2001	7.0	6.0	5.5

Source: Mission estimates

5.04 Based on these estimates, Pusan port's capacity requirement would more than double to 39 million metric tons (mmt) by 1996 from the existing 19.5 mmt capacity in 1985. The increase would in part be required to accommodate increases in bulk cargo of about 7 mmt, the most important growth item being steel and iron, but mainly to accommodate a net increase of general cargo, of about 13 mmt, most of which would be containerized. The tonnage of containerized cargo is expected to more than double between 1985 and 1996. In terms of TEU, the capacity requirement by 1996 would be close to 2.7 million. This would exceed the total capacity of the present facilities (1,020,000 TEU) and of the proposed project (540,000 TEU) which would become operational in 1990; and indicate the need for continuous investment in the early 1990s.

B. Operations Without and With Project

5.05 Without the Project. The Port of Pusan operates 33 berths and a number of wharves for lighters. Of the dedicated berths, four are for passengers, 8 for bulk and break-bulk cargo including grain, coal, iron ore and lumber, one for military transport, and 4 for containers. Among the remaining 16 general cargo berths, 6 usually handle containers also.

5.06 The handling of containers on the dedicated piers 5 and 6 is very efficient, with up to 25 moves per hour for each of the 8 gantry cranes, based on an actual annual average operation of 6.7 hours per day. The present ratio of 20-foot versus 40-foot container per hour is about 55/45 and thus the throughput is a high 36 twenty-foot container equivalent (TEU) per hour. Berth occupancy has now reached 50%. Ship waiting time is small; around 100 days in 1985 when the design capacity of 720,000 TEU was first exceeded. However, the high annual growth rate expected in coming years (8.5% p.a.) would rapidly cause serious port congestion (Table 5.4). This will result in over 5,000 days of ship waiting time by 1990, estimated to cost about W 48.0 billion or US$52 million, and nearly 8,000 days by 1996.

5.07 The handling of containers on the general cargo piers 1 to 4 continues to be slow, inefficient and costly. Except for one berth which is equipped with a container crane, none of the other berths have specialized equipment. Mobile cranes are brought from outside the port by stevedoring companies; or, ship gear are used. In 1984 5,700 feeder container vessels and

general cargo vessels called at these piers handling an average 80 containers per ship. This compares to 1,500 vessels at piers 5 and 6 handling about 460 containers each (Table 5.5). Because space is short, the use of general cargo berths requires moving containers directly outside the port area to off-dock container yards, which results in costly double-handling. The berths available for container handling are highly congested and have reached an occupancy ratio of 95% causing high ship waiting time and requiring lighter-age. The throughput of general cargo and break bulk cargo on the 10 general cargo berths is about 1.2 mmt per year or about 120,000 mmt per berth. Those berths which are fully used can only accommodate small vessels of 1,000 to 8,000 DWT. As the larger berths are used for containers, it will be very difficult to accomodate any further growth of general cargo on piers 1 to 4, although traffic forecast show that by 1996 the demand will reach over 3 mmt.

5.08 With the Project. The proposed project will provide three more berths to be used exclusively for containers. The productivity of the six gantry cranes will be slightly higher than on existing berths because handling on the apron will be by tractor and transtainers rather than straddle carriers. Operational characteristics of the existing and proposed berths are given in Table 5.6. Operation will start in 1990 and all three berths are expected to exceed their economic capacity of 540,000 TEU already by 1991. With the project, liner and feeder container vessels will be handled both at Piers 5 and 6 and at the outer port while containers on general cargo vessels will be handled at piers 1 to 4. Only 4 berths (instead of the 6 now) will be used at piers 1 to 4 for containers, releasing two berths to handle the increasing general cargo. Table 5.7 shows containers handling without and with the proposed berths. It is based on traffic of Table 5.3 and operational parameters of Table 5.6.

C. Costs and Benefits

5.09 The costs and benefits have been evaluated in constant June 1986 prices. Financial cost estimates were converted to economic costs by excluding taxes, duties, and price contingencies.

5.10 Quantifiable benefits attributed to the proposed project are savings in cargo handling cost, ship time and cargo time. Those benefits will accrue to container traffic as well as to general cargo, but only the former were taken into account. Other benefits would result from the reduction of double-handling of containers through piers 1 to 4 . They are estimated at W 54,000 or US$60 per container, corresponding to the additional handling cost per container.

D. Overall Economic Evaluation and Risks

5.11 The benefits build up immediately upon project completion because the port will be heavily congested by that time. The benefits have been assumed constant after 1996 when project facilities will be used at their full capacity.

5.12 The distribution of benefits by the model is shown in Table 5.8. The majority of project benefits are attributable to cargo and ship waiting

time savings. These would accrue both to cargo and ship owners. The latter are likely to be passed on to cargo owners given the strong competition among shipping companies. Therefore, although only 30% of the transport of containers to and from Korea are handled by Korean vessels, it is expected that most of the benefits will accrue to Korea.

5.13 Table 5.9 sets out the rate of return calculation. Costs data are from Table 4.1 and benefits from Table 5.8. The best estimate rate of return is 35%. The sensitivity of the economic returns to variations in costs and benefits are summarized below:

	ERR
Best estimate	35
15% increase in costs	31
15% reduction in benefits	30
Combined 15% increase in costs and 15% reduction in benefits	26

The results show that the project remains well justified even with sizeable variations in project costs and benefits. The assumptions used are conservative as many quantifiable benefits have been ignored. In particular, the assumption that the port could handle all traffic demand by measures such as lightering is a conservative one. Some traffic would have to be diverted to Inchon port at a much higher cost because of distance, or other ports with equally high costs due to congestion and inadequate facilities. Curtailing the traffic is not conceivable as it would have exhorbitant costs to the Korean economy which is heavily dependent on foreign trade.

VI. FINANCIAL PERFORMANCE

A. PDMPA Past Performance (1983-85)

6.01 Pusan Port has had a steadily improving financial performance, in terms of the growth of operating revenues, net income and return on assets. This was due primarily to a greater than 5-fold increase in containerized cargo during the previous decade and by 1985 it accounted for approximately 54% of total traffic and provided over 60% of port revenues. Tables 6.1-6.3 contain the detailed past performance from which key data are summarized below:

	1983	1984	1985
	---------- (Won billion)----------		
Operating revenues	30.0	36.7	40.4
Operating income	20.8	28.9	32.4
Net fixed assets in use	164.5	190.9	215.9
Rate of return (%)	13	16	16
Debt service ratio	2.2	2.5	2.6

The results, are excellent both in terms of level and trend. This outstanding performance is expected to continue over the long term due to the favorable combination of continued traffic growth and greater productivity. These results are highly beneficial to the overall port subsector because PDMPA's profits helped to guarantee the viability of KMPA, its parent organization.

B. Current Position and Plans

6.02 Due to the favorable operating conditions, PDMPA's financial position was sound at the end of 1985. Its balance sheet showed that the port did not borrow excessively to finance its recent expansions, resulting in a low (34/76) debt equity ratio. Other key measures such as the debt service ratio (2.6) and the rate of return on net fixed assets in use (16%) all confirm the PDMPA financial position. The fact that past investments were directed at its most profitable service largely explains this sound position.

6.03 PDMPA will also be the first DMPA to benefit from the two proposed Action Plans because the pilot finance and management program (para. 2.22) will be implemented at its container terminal and it is one of the prime beneficiaries of the Container Handling Action Plan. This should, in the short term, lead to better asset management and increased earnings at the container terminal. In the long term, as the Plan implementation is expanded to all other terminals, PDMPA's position will be further enhanced.

C. Future Performance (1986-92)

6.04 Pusan port will continue to perform well due to significant growth in container cargo handling and overall port productivity. Forecast performance is best illustrated by the data below which is taken from Tables 6.1-3:

	1986	1988	1990	1991	1992
			Won Billion		
Operating revenues	44.5	54.0	65.6	72.3	79.7
Operating income	35.6	42.1	48.1	50.9	56.7
Net fixed assets	237.9	327.3	480.2	568.0	600.2
Rate of return (%)	16	15	12	10	10
Debt service ratio	2.8	1.8	1.6	1.7	1.8

6.05 The main assumptions underlying these forecasts are that annual traffic growth will range between 7-8.5% (para. 5.03) and tariffs will be increased only to cover inflation; based on previous Bank experience at Pusan, these are very conservative assumptions. The fixed assets will increase significantly during the period due to the combined effect of annual asset revaluations and large additional investments. There will therefore be a greater growth in fixed assets than in revenues, resulting in a declining rate of return until 1991/92 when it levels off at 10%. Afterwards, with the growth in traffic, increased utilization of the new facilities and continued revenue growth, the rate of return will gradually rebound to the 12% level. The forecast data also show that the debt service ratio will remain in an acceptable range (1.6-2.8) during the period. In addition, PDMPA's operating ratio will remain below 40, a level which is satisfactory.

6.06 The forecasts also indicate a satisfactory cash flow situation for PDMPA (Table 6.2). During the implementation period, PDMPA should therefore generate sufficient funds to notionally cover debt service and contribute a reasonable amount to investments. Hence, in terms of funding sources PDMPA net internal generation funds would provide 38%, the Government, 12%, and long-term loans, 50% of investment needs. The following table gives a summary of sources and uses of funds during the peak period.

Item	Won billion 1986-90
Net PDMPA income	137.0
Foreign borrowing	182.0
Net Government contribution	44.7
Total Funds Available	363.7
Funds required for investment	363.7

D. Sensitivity Analysis

6.07 The project is expected to enhance the PDMPA financial position because it will finance an expansion of the port's highly profitable container handling service. A sensitivity analysis was done to measure the effects of lowered traffic forecasts and higher operating costs on forecast performance. The results are summarized below.

Item	1986	1988	1990	1992
Base Case				
Rate of return (%)	16	15	12	10
Debt service ratio	2.8	1.8	1.6	1.8
Alternative I: Lower traffic growth (5% p.a)				
Rate of return (%)	15	12	9	8
Debt service ratio	2.6	1.6	1.3	1.6
Alternative II: Higher operating cost (10% p.a.) and lower traffic (5% p.a.) growth				
Rate of return (%)	14	12	9	7
Debt service ratio	2.5	1.6	1.3	1.4

The results show that PDMPA financial performance would remain favorable. Given past high traffic growth and low cost increase trends, it is unlikely that alternatives I and II would occur. The analysis therefore reinforces the soundness of the investment.

VII. AGREEMENTS REACHED AND RECOMMENDATIONS

7.01 During loan negotiations assurances were obtained from Government that:

(a) KMPA will:

(i) carry out the training program for port planners and managers (para. 2.16);

(ii) ensure KMPA and PDMPA will take all necessary measures including to keep tariffs at appropriate levels to enable them to maintain respectively a 5% and a 7% rate of return on their net fixed assets in use (para. 2.20);

(iii) confirm its agreement to carry out the Action Plan to improve KMPA's financial and managerial functions according to an agreed schedule (para 2.22 and Annex 6) which includes:

a. computerizing and extending commercial accounting to all DMPAs;

b. implementing a cost accounting system; and

c. developing a management information system.

(iv) have its accounts and those of PDMPA audited by independent auditors acceptable to the Bank and that the reports will be furnished to the Bank within eight months of each fiscal year end (para.2.25);

(v) carry out a study to update the Master Plan for Pusan port taking into consideration the developments at Gamchon Bay and the City (para. 3.10); and

(vi) select all consultants in accordance to Bank's guidelines and submit draft terms of reference and contracts for review by the Bank (para. 4.10).

(b) KMPA and KNR will confirm their agreement to carry out the Action Plan to improve container handling, according to an agreed schedule (para. 3.13 and Annex 7); and among other actions, will for their respective part:

(i) for KMPA to have a study carried out to compare the merits of the various alternatives for managing the proposed terminal in accordance with terms of reference and schedule to be agreed with the Bank (para. 3.07);

(ii) for KMPA to have a study carried out for the consolidation of Pusan's off-dock CYs in the proposed Dong Myung area next to the proposed project site in accordance with terms of reference and schedule to be agreed with the Bank (para. 3.13); and

(iii) for KNR to have a study carried out to increase throughput of container trains to accommodate traffic requirement by 1990 when the outer port starts operation (para. 3.13).

(c) KMPA, KNR and other parties concerned will hold annual reviews of the two proposed Action Plans, with a view to update targets if and when necessary. Any proposed adjustment in targets would be made available to the Bank for review and comments (para. 4.04).

7.02 Formal approval by the Government of the two proposed Action Plans that were finalized during negotiations (paras. 2.22 and 3.13) has been received.

7.03 Signing of a Subsidiary Loan Agreement satisfactory to the Bank will be a condition of loan effectiveness (para. 4.06).

7.04 With the above assurances, the proposed project is suited for a Bank loan of US$141 million to the Republic of Korea for a term of 15 years including a three year grace period and at the standard variable interest rate, for onlending to KMPA on the same terms and conditions.

ANNEX 1

KOREA

PUSAN PORT PROJECT

Related Documents and Data Available in the Project File

1. Sector Memorandum: Korea's Port and Shipping Subsector, February 1986.
2. Details of Economic Evaluation, February 1986
3. Feasibility Study of Pusan Port third phase development, by Lyons Assoc. and KECC, 1982 (5 volumes).
4. Detailed Engineering for Pusan Port third phase development by Lyons Assoc. and KECC, 1983.
5. Statistical Yearbook, KMPA, 1983, 1984.
6. Site Selection Study by Kiri-Sekwang, 1985.
7. Financial Status of KMPA, Past and Future Performance, February 1986.

KOREA

PUSAN PORT PROJECT

Past Five-Year, Transport Development Plans and Bank's Involvement (1962-81)

1. The First Plan (1962-66) devoted about half of transport investments to modernize and strengthen rail system capacity. Some 275 km of industrial track were built (Tonghae Puku line); the conversion from steam to diesel traction was started with large imports of locomotives and diesel rail cars; the fleet was modernized with large imports of passenger and freight cars while a large number were locally made. The Second Plan (1967-71), in contrast to the First, devoted about 60% of transport investments on highway improvement. Some 655 km of expressways were built (Seoul-Pusan, Ulsan-Onyang, Seoul-Inchon and Taejon-Chonju) and the motor vehicles fleet increased by nearly 100,000 units. In the railway sector, 180 km of new tracks were constructed (Kyonggon line), and 50 km doubled-tracked (Honam line); the fleet continued to expand with very large imports of diesel locomotives, passenger and freight cars, while more were built locally and rehabilitated. In the maritime sector, 800,000 GT of ocean-going ships and 130,000 GT of coastal ships were added, while Pusan port stevedoring facilities were expanded and Inchon and Ulsan ports were developed to accommodate foreign trade and to establish industrial coastal zones.

2. The Third Plan (1972-76) gave priority to the highway and maritime sectors which received 47% and 28%, respectively, of transport investments. Some 490 km of two-lane high-speed highways were built (Chonju-Pusan, Wonju-Kangreung), a national road maintenance organization was established and the motor vehicles fleet expanded further by 210,000 units. In the maritime sector, expansion of Pusan and Mukho ports was started, while Incheon port was developed further with the help of the Asian Development Bank (ADB); the fleet was increased by some 1.3 million GT. In the railway sector, the line capacity increase continued through electrification of 320 km of heavy traffic industrial lines (Chungang, Taebaek and Yongdong), and about 100 km of the Seoul Metropolitan System (SMESRS); about 90 km of new tracks were laid including 9.5 km of the first subway line in Seoul. In the aviation sector, the international airports of Seoul Kimpo, Pusan-Kimhae and Cheju were expanded while ten jet liners were imported.

3. The Fourth Plan (1977-81) directed investments at the consolidation of the basic transport infrastructure developed over the previous decade by completing missing links, while also starting to promote better efficiency in the operation of the transport system. The emphasis was placed on expenditures for maintenance and renovations rather than on investments for new facilities, with the major exception being a large-scale subway construction program designed to alleviate urban transport congestion in Seoul City. The basic highway network was completed by widening to 4 lanes the Masan-Pusan expressway and constructing the Taegu-Masan 85 km two-lane expressway. A large-scale paving program for national roads was also started to bring the

paved portion to 68%, a target that was not reached partly due to reclassification. In the railway sector, some 160 km of double tracking were completed (Chungbuk and Gyeongbu lines) while large numbers of electric cars, diesel locomotives, passenger and freight cars and workshops were added. In the maritime sector, the first Busan container port and Mukho coal port were completed; and a second expansion of the Busan container area was started. Inchon expansion, started in 1974, was completed in 1978 with the assistance of ADB, through the addition of 20 deep-water berths, including 5 container berths and 4 breakwaters.

4. The past achievements under development plans in the transport sector are very impressive as evidenced by large networks and fleet expansions as well as by modernization. However, funds expended under the national plans reflect only part of total investments in the transport sector. Local government investments, including those of provinces, counties, cities and special cities, are not included in the plans unless they are funded at least in part by the central budget. Omitting to take them into account would considerably distort the assessment of the real magnitude of Korea's progress. In particular, the four Special Cities (Seoul, Pusan, Taegu and Inchon) road investment programs were not shown in the Fourth Transport Plan although with over W 700 billion at current prices (nearly US$1 billion), 80% of which was in Seoul City, they represented 37% of the country's overall road investment. In comparison, W 880 billion or 46% were spent on national and express highways and W 328 billion or 14% on provincial, county and city roads.

Performance Assessment

5. Broadly, the basic objectives of the transport development plans were met as the network expanded fast enough to accommodate economic growth. The general approach that gave priority to large investments to increase system capacity was the most appropriate. The traffic grew so fast that halfway measures, such as rehabilitation and improvement of the deficient network of the 1960s, would have been insufficient and short-sighted.

6. The highway development policy was geared to develop a network of roads to serve the short and medium distance traffic for which they have an economic advantage over the railways. The Road Plan developed in 1968, in consultation with the Bank, proposed a very ambitious program consisting of: (a) the development through 1986 of a network of about 4,000 km of trunk highways to form a grid of longitudinal and transversal axes linking the four major gate ports of Inchon, Pusan, Mogpo and Mukho toward inland centers, and (b) the construction over a 10-year period of a 1,600 km two-lane expressway network designed on separate alignments from the old roads, that could be expanded when traffic volumes would require it. The program was 75% completed and was determinant in localizing industries around Seoul and in most provincial capitals, speeding the urbanization process as the population migrated more easily from rural areas. The voluntary delay in improving the secondary and tertiary networks was justified in view of the highway requirements of the industrialization policy.

7. Similarly, the railway investment policy was directed at strengthening its transport capacity for bulk freight and long distance passenger traffic where the railways have a comparative advantage. Investment in modernization, double tracking and electrification of the most heavily used freight line (14 million tons p.a.) enabled the railway to perform more efficiently and to cope with demand. In particular, it helped increase express train traffic from 1 billion passenger-km in 1971 to 11 billion in 1983, to make large profits. However, to keep freight or recover local passenger traffic that would be better handled by road transport, the railway attempted to compete by investing in improvements that were economically not so justified and had to apply a fares policy for ordinary trains that could not cover operating costs. Also the Government forced the railways to invest in infrastructure for other than strictly economic reasons such as doubletracking of the Chung-Buk line.

8. Past investments, geared to the development of ports, including those of Pusan, Inchon and Ulsan, were necessary to cope with the large increase of ocean-going freight and to attract heavy industries to coastal areas. Also, the Pusan containerization program was effective in reducing handling costs and expediting flows of cargo, although custom clearances still impose lengthy transit delays. However, efforts were too restricted to the major ports. A national port development policy remains to be introduced to shape the future role, number and localization of lesser ports, particularly to support coastal shipping which has scope for much expansion, given the geography and political situation which make Korea a de facto island. Progress in the shipbuilding industry has been very instrumental in modernizing the domestic fleet, which has proven to be a source of foreign exchange earnings. An expansion of air transport was also timely in serving the many foreign and local businessmen who were the artisans of Korea's fantastic exports expansion that increased from 1962 to 1978 at an average of 27% p.a.

The Bank's Involvement

9. The Bank has played an active role in advising and assisting the Korean authorities in pursuing their transport objectives. Since 1962, the Bank Group has assisted the KNR through nine railway projects amounting to US$623 million. The first seven projects have been satisfactorily completed and the eighth was substantially modified to account for slower imports of coal. This project for Coal and Cement Distribution is strengthening the capacity of the railways, ports and inland terminals to cope with the expected increase in transport of these commodities, resulting partly from large coal imports substituting for oil. The Nineth Project for Seoul-Pusan corridor will increase rail capacity with an improved signalling system and other investments. Bank-supported investments have concentrated on improved capacity and service for long distance passenger and bulk cargo transport, The Bank has also maintained an active dialogue on the railway's financial situation, investment plans, level and structure of tariffs. After some deterioration in the 1970s, Government agreed to implement a financial recovery plan for KNR as part of the Seventh Railway Project. A revised plan, following the severe downturn of the economy in the early 1980s, was agreed upon.

10. Since 1969, the Bank has financed six highway projects and a pre-investment credit totalling US$695 million which have had a major impact in assisting Government with the improvement and expansion of the national and provincial road networks and with institution-building in the MOC and MOHA. Significant policy changes, relating to the highway sector, which were effected through the highway projects, include the adoption of more appropriate road standards, revisions of regulations governing vehicle weights and dimensions, and a modified government policy on toll roads. The MOC's organization to maintain the national road network was established and strengthened, as well as that of MOHA, through the provision of technical assistance and road maintenance equipment. Korean consulting firms have benefitted through their association with foreign consultants on the design of road projects.

11. Substantial assistance has also been extended for port development. In part related to Korea's export drive, ports are seriously congested, particularly at Pusan, the biggest port. Containerization was introduced in Pusan with the assistance of the Bank under two port projects totalling US$147 million; the Saudi Fund for Development participated with the Bank in the financing of the first Pusan Port Project. The proposed third port project would further increase container handling capacity at Pusan port, improve internal transport and reduce congestion in the city.

KOREA

PUSAN PORT PROJECT

Tentative Cost Estimates for KNR Component 1/

	Cost US$ thousands
1. Modification of railway car brake systems for 90 km per hour operation - 308 cars at $5,000	1,540
2. Twenty (20) train sets of GLENAYRE rear-of-train monitors to permit running trains without cabooses at $5,000	100
3. Container locking devices - 280 cars at $640 each	180
4. Provide one additional track in PCTOC rail loading yard	
a. Track	100
b. Transtainer	75
Subtotal	2,670
5. Technical assistance	330
Total	3,000

Short Term Action Plan - KNk Detailed Program

1. Select 50 existing container cars, and 2 locomotives in good condition to operate two 25-car trains without caboose between Pugok and PCTOC Pusan at 90 km/per hour, and a fuli cycle turnaround time of 24 hours.

2. Purchase 2train sets of "Gleanayre" rear of train monitors and equip 2 good condition locomotives for service with trains of 25 cars no cabooses.

3. Arrange with trade union to experiment with operation of one train in each direction with two man crews, with one crew operating train between Pugok and PCTOC.

1/ To be financed under Seoul-Pusan Corridor Project (Loan 2600-KO).

4. Operate train between Pugok and PCTOC craneway. Do not shunt train in Pusan station.

5. The start up operation should be at nighttime as present, but under the circumstances of items 1-4 above.

6. After successful trial for 40 days, start the same operation (one train each direction/day) during daylight hours. Vary departure times to learn how to operate trains and the detriments to the operation.

7. After six month sof experience, begin operation one container train with one round trip per day, and then increase the number of train operating on the same pattern until as many trains are operated on this round trip per day pattern.

KOREA

PUSAN PORT PROJECT

Training and Technical Assistance

1. The training and technical assistance requirements are summarized in the following table and explained in the subsequent paras.:

		Local	Foreign	Total
			US$ '000	
Training				
1.	Three port personnel five months each in foreign ports	5	30	35
2.	Eight two-week visit to foreign ports	5	32	37
3.	Two university courses for port planners	20	38	58
	Subtotal	30	100	130
Technical Assistance				
4.	Financial and managerial studies	390	-	390
5.	Operational studies	615	200	815
6.	Preparation of Pusan master plan	310	-	310
	Subtotal	1,315	200	1,595
7.	Construction supervision	1,630	960	2,590
	Total Base Cost	2,975	1,260	4,235

Training

2. Three port personnel will be trained in selected foreign ports for about five months each: two operations managers; and one equipment specialist. Visits of eight port officials to foreign ports, about two weeks each, to observe port management, planning and operations. In addition two port planners are to be sent for one year each to attend planning course at foreign universities.

Technical Assistance

3. Master planning. KMPA control extends over the entire sea-front of the Greater Pusan Metropolitan Area with the developments in Gamchon Bay, Pusan outer harbor area and the Pusan City urban development plan, there is a need to update the Master Plan for Pusan port. This will be done locally under terms of reference to be agreed with the Bank.

4. Financial and managerial studies. Consultants will be retained to improve the financial and managerial functions of KMPA and PCTOC as intended in the Action Plan addressing these objectives (Annex 6). KMPA has successfully implemented a commercial accounting program (1984). The next step will be to introduce an advanced computerized system to develop efficient port operations. In order to do so consultants will be retained under terms of reference agreed with the Bank. These consultants will be funded locally.

5. Operational studies. Consultants will also be retained to formulate measures to be implemented under the Action Plan designed to improve inland container handling (Annex 7). These measures will seek to: (a) improve the productivity of the container terminals; (b) create a market oriented container operation; and (c) introduce business oriented container transport management. Some of the necessary actions will be planned and carried out by Korean experts from the agencies involved, but outside assistance will be needed in some areas. Expatriate personnel will be engaged when the local experience is inadequate. The studies to be carried out are briefly explained below. Terms of reference will be prepared by KMPA to be reviewed by and agreed upon with the Bank.

6. A study is underway by PCTOC of the utilization of CY and CFS. The study will include: (a) analyzing the flow of container traffic into, out of and within Korea; and (b) traffic projections by origin and destination. Based on this study KMPA would devise and update the operating regulations in the container terminal to fully utilize the container terminal with all its facilities. Where existing capacity is short of projected traffic, KMPA will explore alternatives for handling this traffic.

7. A study will be carried out by KMPA and the City of Pusan to improve road access to existing and planned on-dock and Dong Myung CYs. The study will include the possibility of establishing an over-pass for the rail spur to the existing container terminal. At the same time the T-junction of the road access to Seoul-Pusan expressway will be studied, planned, designed and implemented within the proposed project.

8. A study will be carried out by KMPA concerning the relocation off-dock CYs in the Pusan area to the the Dong Myung area adjacent to the proposed project. This study will investigate the possibility to operate this new CYs in a collective way.

9. A study will be carried jointly by KMPA, KNR and MOT to design, and establish marketing systems for container services of KNR, PCTOC and new outer harbor terminal. This study would formulate policies, procedures, regulations and possibly schedules to meet users needs and attract traffic. Full

advantage should be taken of the new rail/truck container terminal at Pugok near Seoul, so that it becomes, in effect, an extension of PCTOC terminal in Seoul.

10. A study will be carried out by KMPA to study the alternatives for managing the new container terminal under the proposed project. This study should test the following alternatives: (a) unifying the management of both terminals under PCTOC; (b) creating a new terminal operating company for the new outer harbor terminal; and (c) using a private company to manage the new terminal. The study should define the advantages and disadvantages of each alternative and compare them and recommend the optimum plan. The study should also propose ways to move containers between the two terminals.

11. Construction supervision. The proposed project was designed by consultants (Lyons Associates and Korea Engineering Company (KECC)). KMPA is going to assign the supervision of construction for the proposed project to KECC assisted by few expatriate consultants. The terms of reference for the supervision and the contract will be reviewed and agreed with the Bank.

SUGGESTED DRAFT

KOREA

PUSAN PORT PROJECT

Draft Letter by KMPA and KNR Introducing the two Action Plans

Mr. Attila Karaosmanoglu
Vice President
East Asia and Pacific Region
International Bank for Reconstruction
and Development
Washington, D.C.

Re: Pusan Port Project - Implementation of Action Plans

This letter is to inform you of specific actions KMPA and KNR will take so as to address outstanding issues in the port subsector and the transportation of containers in Korea. The objectives of the Korea Maritime and Ports Administration (KMPA) are to further develop KMPA as an institution by improving its financial and managerial functions as well as to respond efficiently to transport demand by increased utilization of existing container handling facilities. The objectives of the Korea National Railroad (KNR) are to improve the quality of container rail service and to reduce cost of handling containers by rail. As you know, these objectives are consistent with the national transport sector development goals that were to be achieved during the Fifth Five-year Economic and Social Development Plan, and also the new objectives proposed in the Sixth Plan (1987-91).

Two Action Plans to reach those objectives have been set up.

The first one outlines the steps KMPA will follow to increase its efficiency as a modern port management institution. The Plan is designed to improve financial management, establish the true costs of providing various services and improve the flow of information. The implementation of this program of actions will not only help KMPA to fulfill previous agreements made with the IBRD but also fully equip it to meet the challenge of the 1990s.

The second Action Plan deals with the rationalization of container cargo transport and will be jointly implemented by KMPA and KNR. Measures to be taken will help to:

(a) better utilize the container facilities at Pusan port;

(b) improve the energy efficiency of inland container transportation;

(c) reduce double handling of containers; and

(d) improve Pusan urban environment by reducing city-street traffic congestion.

A critical factor in designing this Action Plan was our desire to provide the least cost alternative, in terms of transport energy consumption as well as overall costs. In planning further expansion of port container-handling installations we will continue to keep these factors in mind.

KMPA and KNR are committed to carrying out these plans by the agreed dates. The proposed Pusan Port Expansion Project is a suitable framework in which to implement these Action Plans. These plans will be executed under our joint responsibility and are attached for your consideration.

With best regards,

Administrator KMPA Seoul, Korea	Administrator, KNR Seoul, Korea

Attachments (2)

KOREA

PROPOSED GOVERNMENT PLAN OF ACTION

UNDER PUSAN PORT PROJECT

IMPROVEMENT OF KMPA FINANCIAL AND MANAGERIAL FUNCTIONS

Background

At appraisal of the First Port Project in 1972, it was agreed that a new body would be created to manage the different ports which were then under the jurisdiction of a number of agencies spread across different government ministries. In late 1974, under the First Port Project (Loan 917-KO), Consultants Booz, Allen, and Hamilton International (BAHINT) were hired to design new prototype commercial accounting, costing and management information systems for the proposed port entity. This entity was established in 1976 as the Korea Maritime and Ports Administration (KMPA). Subsequently, under the Second Port Project (Loan 1401-KO), another group of consultants was hired to update the BAHINT's study findings on commercial accounting and implement them within KMPA. These efforts were all intended to develop KMPA as an entity with considerable financial, managerial and organizational autonomy. However, due to the newness of KMPA, this period was one of a difficult climate for institution building efforts. Repeated and frequent staff transfers always slowed the momentum of the various stages of the effort.

Current Status

KMPA has, by 1984, been able to successfully implement a commercial accounting program as required by the loan agreement for the Second Port project. This implementation was staged over a five year period. it was done primarily by using consultants to define the steps in the process and to subsequently conduct extensive staff training programs. Once trained, the initial group worked under the guidance of consultants to restate KMPA administrative type accounting into a more commercial basis. Later on with more trained staff available the actual bookkeeping was prepared on a commercial basis, starting in PDMPA and then spreading to all other DMPAs. Reasonably accurate financial statements are now prepared and they fully reflect current conditions as KMPA, by itself, has this year revalued all fixed assets. The next step will be to introduce an advanced computerized system to develop, in a first phase, efficient port operations. In order to do so, KMPA plans to use consultancy services.

Objectives

KMPA is now interested in continuing its financial and managerial development under the proposed Pusan Phase III Development Project. Our objectives include: (a) computerizing the commercial accounting system; (b) revising designs for a cost accounting system and implementing them; and (c) computerizing the port operations system as a first step in introducing the management information system. Our approach will be to develop concepts, prepare plans and implement them.

Actions and Measures Required

Actions will be taken on a pilot basis at Pusan Container Terminal Operating Company (PCTOC) and subsequently in other DMPA's, staged in accordance with consultants findings. KMPA will, therefore, prepare Terms of Reference (TOR) for computerizing port operations and the accounting function as well as for designs of the cost accounting system. The TOR will be sent to the IBRD for review by June 1, 1986. Proposals for consulting services will be requested by July 15, 1986 from short listed, suitable firms.

PCTOC Pilot Program

PCTOC deserves special mention because its financial management needs to be further developed and also because it is an appropriate unit for testing changes, such as increased delegation of managerial responsibility, to better respond to demand. Currently, only one of the PCTOC functions is well run, i.e. the stevedoring operations at the quayside. It is recognized that under full distribution of costs, the entire Container Yard (CY) and Container Freight Station (CFS) operations are losing money. This has partly to do with rules governing their usage and also due partly to the fact that it is inherently difficult to optimize the management of a container terminal solely by administrative procedures. PCTOC management will be given gradually more flexible rules which will allow it to be more responsive to market needs and changes. For this purpose, PCTOC is presently conducting an analysis of its CY and CFS traffic patterns as well as a survey of its users' preferences. This study will be completed by December 1985. Measures that are subsequently expected to be considered for implementation might include:

(a) PCTOC will have consultancy services to analyse its tariffs starting July 1987. From the outcome of these services PCTOC will revise its tariff system so as to utilize its facilities more profitably.

(b) PCTOC could implement on a pilot basis certain aspects of the cost accounting of the present Plan of Action. The necessary steps for this purpose are detailed in Appendix 2.

The main actions to be implemented as part of this Plan in the various DMPA's and KMPA are outlined below. A more detailed description of those actions in the form of an outline contents of the draft Terms of Reference (TOR) for required studies, is given in Appendices 1-4.

Commercial Accounting

Its computerization and extension to all DMPA's will be a major undertaking. To do so, KMPA will carry out the following actions:

(a) implement a program of professional training for both staff and management (by June 1988);

(b) Develop the computerization plan (September 1986 - May 1988);

(c) Seek Ministry of General Affairs (MOGA) agreement and hire computer accounting staff (June 30, 1989).

(d) Implement computerization in stages as outlined in Appendix 2.

Completion of these actions will enable the preparation and timely delivery of financial statements throughout the KMPA network.

Cost Accounting

These actions will enable KMPA to first develop a manual, and later a computerized cost accounting system. The analysis of the costs will provide important information for port management on the profitability of various operations including the handling of specific cargo/service. As this is a subject of limited experience within KMPA, outside assistance will be sought. KMPA will, therefore, take the following actions:

(a) design the cost accounting system, using consultants (June 1987).

(b) Initiate manual implementation at PCTOC (December 1987).

(c) Commence manual implementation at PDMPA (January 1989).

(d) Prepare a plan for computerizing it (January 1990).

(e) Convert PDMPA to computerized cost accounting (December 1992).

(f) Extend to major DMPAs according to timing to be agreed with the Bank.

These steps and dates are subject to change, depending on the outcome of the consultants study. This will be discussed with the IBRD before implementation. The cost accounting system will be most useful in deciding, planning and marketing port services. This will be critical in coming years as more and more ports in Asia become modernized and competition for traffic increases.

Management Information System

KMPA has already purchased some of the hardware required for computerizing the port operations system as a first step in developing a management information system. It will first cover seamen's records, vessel entry/exit and cargo statistics by 1986 and subsequently operational, and accounting functions by 1992. KMPA has already budgeted funds for studies and assistance needed to develop this system. Basically, it is a 5 year program which will include the following:

(a) The evaluation of the adequacy of the existing flow of information to management (June 1987).

(b) Develop and approve a plan for the MIS, using electronic data processing (EDP) (June 1989).

(c) Incorporate information from the newly developed commercial and cost accounting systems within the MIS design (December 1988).

(d) Train port personnel (10) during the design stages (June 1988).

(e) Test implementation at PCTOC (December 1989).

(f) Implementation for computerized port operations (December 1992).

(g) Extend to major DMPAs according to timing to be agreed with the Bank.

The implementation of a computerized MIS will be major step forward in enhancing the managerial control and efficiency of KMPA. This is essential to the proper focussing of its resources to support its development strategy.

Implementation of the Plan of Action

Agencies Responsible. The Administrator of KMPA will be responsible for overall implementation of the action plan and, where necessary, approval for certain steps will be sought from the Economic Planning Board (EPB), and the Ministry of General Affairs (MOGA) and the Ministry of Transport (MOT). KMPA will ensure that the main provisions of the action plan are reflected in the Sixth Five-Year Development Plan (SFYDP), 1987-91.

Assistance Required. Korean and foreign consultants will be used where necessary. Local funds for financing them have been included in KMPA's budget request for 1986. The cost of this component is included in the Pusan Port Project.

KOREA

PUSAN PORT PROJECT

APPENDICES OF DRAFT

GOVERNMENT PROPOSED ACTION PLAN

TO IMPROVE KMPA'S FINANCIAL AND MANAGERIAL FUNCTIONS

COMMERCIAL ACCOUNTING

Objective

To provide the management of KMPA and each DMPA with the ability to accurately record the results of operations and to begin developing a computerized accounting system which links each DMPA to KMPA.

Action Required

Implement a continuous program of professional training for both the staff and management. The training program will deal with both government and commercial accounting and will consist of:

Staff:
- (a) Preparation of financial statements
- (b) Audit procedures
- (c) Ratio and percentage analysis
- (d) Variance analysis

Management:
- (a) Trend analysis
- (b) Variance analysis
- (c) Exception reporting

Detailed Terms of Reference will be prepared by KMPA to develop a plan to computerize the financial accounting function within KMPA. This will form part of the Terms of Reference to be submitted to the IBRD for review by June 1, 1986.

The development of the computerization plan will begin on September 1986 and it will be completed by May 1988. The Plan will indicate:

(a) the functions to be computerized and the priority of each;

(b) available software packages that could be used by KMPA with minimal modifications;

(c) those accounting functions for which no suitable package exists; and

(d) the estimated hardware, software, and training needed and the approximate cost of each.

KMPA will seek the approval of the Ministry of General Affairs (MOGA) by March 31,1989 to obtain the necessary staff and commence implementation.

Computerization of the accounting functions identified in the plan will be implemented one at a time. The initial implementation of each function will be conducted by PDMPA. Once the system has been proven, it will be implemented at the other major DMPAs and KMPA.

Implementation of the first area to be converted to a computerized system will begin at PDMPA by January 1, 1989. Implementation of all of the systems will be completed by:

PDMPA and PCTOC	December 31, 1991
Other Major Ports and KMPA	December 31, 1993

COST ACCOUNTING

Objective. To provide the management of PCTOC and KMPA with a manual, and later a computerized, system to accumulate the full cost of operations by functional area so that the operating expenses can be minimized, and so that a system of tariffs can be developed which are based on the actual cost of providing the specific service. Once developed, the cost system will be utilized by KMPA and the DMPAs.

Actions Required

1. KMPA will include the design of the cost accounting system using profit centers in the Terms of Reference to be sent to IBRD by June 1986 for review. The cost system will be designed for PDMPA but implemented initially by PCTOC.

2. PCTOC Program. KMPA will identify the cost and revalued bases of the assets used by PCTOC. This analysis will be in sufficient detail so that the assets can be grouped into the profit centers used in the PCTOC cost system. This will be completed by June 30, 1987.

3. KMPA will identify all loans received to develop the PCTOC facility and the related interest expense and debt amortization payments associated with those loans. This will be completed by June 30, 1987.

4. KMPA will transfer the record keeping of the original cost of the PCTOC assets, their accumulated depreciation, any subsequent asset revaluations, and the balance of the applicable loans outstanding to PCTOC as of June 30, 1987.

5. PCTOC will record the transfer of the items listed in para. 4 above, and revise its financial records and statements to show that the annual payment to KMPA consists of:

Depreciation Expense
Interest Expense
Debt Amortization Payments
Operating Lease Payment

The total of these payments will equal the annual lease payment as it is currently calculated. These revisions will be completed by June 30, 1987.

6. KMPA will by September 30, 1987 obtain the necessary staff and conduct the training required so that the implementation of the manual cost system can be done by PCTOC.

7. By January 1, 1988, PCTOC and KMPA will review the calculated operating income for each profit center and the net income for PCTOC and determine what actions are necessary in order to correct any problems identified.

8. By end 1991, PCTOC computerizes the cost accounting system.

9. General Program. The design of the cost system will begin on January 1, 1987 and it will be completed by June 30, 1987. The system design will be:

(a) structured according to facility, type of activity and tariff item;

(b) capable of identifying expenses as fixed, variable, and controllable;

(c) consistent with cost systems used by major ports in the world; and

(d) capable of being modified so that it can be implemented by the DMPAs and be computerized at a later date.

10. KMPA will develop a series of management reports, based on the needs of senior management, to effectively evaluate the operating results of each profit center and the organization as a whole. The development of these reports will be completed by August 1, 1987.

11. By January 1, 1988, KMPA will prepare a schedule to implement this manual cost system at KMPA and at each of the DMPAs. Implementation will begin with PDMPA, and it will be completed by January 1, 1991.

12. KMPA will begin converting this manual cost system to a computerized one by preparing an appropriate action plan and terms of reference by January 1, 1989. Conversion of the largest DMPAs will commence by January 1, 1991.

MANAGEMENT INFORMATION SYSTEMS

Objective. The implementation of a computerized MIS will provide the management of each DMPA, PCTOC and KMPA with the operational and cost information needed to effectively manage the ports' operations.

Actions Required

1. Prepare Terms of Reference for the MIS portion of the consultancy services (June 1, 1986).

2. After the terms of reference have been reviewed by the IBRD, KMPA will request that proposals from consultants, on the short list, be submitted by October 1, 1986.

3. The consultant begins work on October 31, 1986 and completes the following tasks by December 31, 1988:

   (a) evaluate the adequacy of the reports and processes comprising KMPA's current MIS by June 1, 1987;

   (b) develop a framework (master plan) for the revised MIS utilizing electronic data processing by June 30, 1989;

   (c) incorporate information from the newly developed cost accounting system with the port operational data;

   (d) develop a training program for the port personnel.

4. KMPA completes computerization of port operations component by December 1992.

5. System extended to major DMPA's according to timing to be agreed with the Bank.

DEVELOPMENT OF FINANCIAL AND MANAGERIAL FUNCTIONS MONITORING INDICES

	Implementing agency	Need for and origin of assistance		Target date for implementation	
		Korea	Foreign	Start	End
DEVELOPING MAIN FUNCTIONS					
Commercial Accounting					
Prepare TOR for accounting computerization	KMPA	X		Ongoing	10/01/86
Computerization implementation plan	KMPA	X		09/01/86	05/31/88
Obtain staffing approval	KMPA/MOGA			01/01/88	06/30/89
Staged implementation	DMPA's	X		12/31/91	12/31/95
Cost Accounting					
System design TOR	KMPA			Ongoing	10/01/86
Design cost system	KMPA	X	X	01/01/87	06/30/87
Initial implementation	KMPA/PCTOC			01/01/89	01/01/91
Staged manual implementation	PDMPA	X		01/01/89	01/01/91
Computerized conversion	DMPAs	X		01/01/91	12/31/92
Management Information System (MIS)					
Submit TOR to IBRD	KMPA			Ongoing	10/01/86
Evaluate existing information system	KMPA	X		09/01/86	06/01/87
Develop master plan	KMPA	X	X	07/01/87	06/30/89
Incorporate accounting needs	KMPA	X		07/01/87	12/31/88
Test implementation	KMPA/PCTOC	X		01/01/89	12/31/89
Link systems	DMPA's	X		01/01/90	12/31/95

	Implementing agency	Need for and origin of assistance		Target date for implementation	
		Korea	Foreign	Start	End
INSTRUMENTS					
Training					
Implement a management training program	KMPA/MOT	X	X	Ongoing	06/01/88
Train senior management in computer applications	KMPA/MOT	X		06/01/87	06/01/89
Computerization					
Develop a 5 year computerization program for: Commercial accounting, budgeting, property and supply control, cost accounting, strategic planning, port operations, cargo statistics, personnel management, etc.	KMPA/MOGA	X	X	Ongoing	1995

KOREA

PROPOSED GOVERNMENT PLAN OF ACTION

UNDER PUSAN PORT PROJECT

IMPROVEMENT OF KOREA'S INLAND CONTAINER HANDLING OPERATIONS

Existing Container Handling System and Problem Areas

Container Handling Operations in Korea are generally quite effective and relatively economic; throughput is high and the computerized container yard (CY) stacking and inventory systems are quite efficient. Between 1979 and 1984 container traffic through the Pusan Container Terminal Operating Company's (PCTOC) grew at more than 20% per year and the PCTOC share of total Pusan container traffic increased from 44% to 62%. In spite of this record, further improvements could be made to use the existing facilities even more efficiently. These would help in accomodating part of the substantial increase in traffic expected before the new outer-harbor terminal can become operational. These would also help in improving the organization, policies and staffing for the operation of the new and existing terminals. Korean National Railways (KNR) has recently opened a modern rail container terminal for the Seoul area at Pugok and has steadily increased the volume of rail shipment of containers between Pusan and Seoul but much more needs to be done to realize the full potential for rail service. Evidence of needed improvements include:

(a) although the large number and size of off-dock container yards in Pusan create a serious traffic congestion problem, PCTOC's container yard (CY) and container freight station (CFS), at present, are much less than fully utilized.

(b) although rail shipment is the most economical means of container transport between Pusan and Seoul (only 22% of such traffic moves by rail), neither KNR's installations nor PCTOC's rail transfer facility are utilized to near their capacity;

(c) neither KNR nor PCTOC has a commercially oriented marketing organization needed to seek out and develop traffic so as to ensure optimum utilization of the facilities they operate; and

(d) coordination of necessary activities between Government Agencies such as KMPA, KNR and the city of Pusan is not satisfactory.

Objectives

To resolve the above inefficiencies, concentrated efforts are needed to plan and prepare for specific actions to achieve the following objectives:

(a) to increase the throughput capacity of the Korean container handling system so as to permit handling the expected increase in container

traffic in the period 1986-1989 before the new Pusan outer-harbor container terminal is available;

(b) to store, stuff and strip the maximum practicable number of containers within the PCTOC terminal and in the new outer harbor terminal and proposed Dong Myung CY when they are available, so as to reduce the need for off-dock CY's and relieve traffic congestion in Pusan city;

(c) to improve KNR's operations including speed and reliability of rail container shipment, improve layout of PCTOC's rail transfer facility so as to provide low-cost rail services directly to customers and to optimize the split of container traffic between rail and road in the Seoul-Pusan corridor;

(d) to design and set up well before the end of 1989 an organization to operate the new outer-harbor container terminal with its operating procedures and staffing; and

(e) to design and establish a business oriented organization to manage port and rail container services and to market them to users; in this respect, integrated operation of the Pugok Terminal with the on-dock terminals in Pusan shall be considered.

Discussion of Actions Required

The three following entities will be directly involved in defining the measures and actions to be taken that would be implemented as part of this Plan of Action:

- the Port of Pusan (KMPA/PCTOC);
- the railroad (KNR); and
- the city of Pusan

Productivity Increases. (i) With respect to the port, action is needed to expand container handling capacity in the short term prior to the opening of the new outer-harbor container terminal as well as to optimize the operation of the new terminal when it opens by 1990. This includes improving the use of space within PCTOC's terminal by such measures as increasing the average stacking height and ensuring faster dispatch to and from shippers. Even if the CY of PCTOC would be fully utilized, only a minority of the containers stored outside in off-dock terminals could be accomodated there due to space limitation. The proposal to establish an area at the Dong Myung former plywood plant in which to store containers that cannot be accommodated on-dock will be pursued (especially for the substantial inventory of empty containers needed to support Korean exports). Studies will be undertaken to determine the scope of the development, design the installation, provide adequate road access and develop a system of incentives which will induce off-dock CY users to move to Dong Myung. (ii) With respect to the railways, improvement of the rail container shipment service is needed in order to more fully utilize and expand the installations at Pugok by integrating its operations with the port. Increases in length, speed and frequency of container trains will be

implemented and will help further reduce rail tariffs between Seoul and Pusan. The ongoing installation of the Centralized Train Control (CTC) system on the line will provide an opportunity for major improvements in this respect. Improvement of port and rail operations will reduce the need for off-dock CY and the resulting movement of containers through the streets of Pusan. (iii) With respect to road access, joint action between the city and the port will be needed to improve access to the expanding port installations and to reduce congestion in the city.

Marketing Better Services. In the case of both the port and the railway, the services provided suffers from a lack of a commercially oriented marketing program designed to: (a) ascertain the needs of the customers, (b) produce a system to meet them at least cost and (c) make its availability well known to the customers. In many ways, the problem is a joint one for the two agencies. For example, the integrated operation of the terminal at Pugok and the Pusan container terminals shall be studied so that a single arrangement by a shipper and a single document should be sufficient to move a container between the Pugok terminal and container ships in Pusan. Existing franchise arrangements which permit only a part of the container shipping industry to use the Pusan on-dock and Pugok container freight stations or the rail loading facilities need to be replaced with marketing oriented arrangements that actively strive to see that these expensive installations are adequately utilized.

Introducing Business Oriented Management. The commercial orientation necessary to market container services implies a need to examine carefully the various alternative management systems which could be employed, i.e., government operation by specially trained personnel or operation by separate companies totally or partially government owned or privately owned. Such a system will provide overall management for port and rail container services. It will handle marketing and customer relations. In order to carry out these functions, it would need to operate the computer system which should not only manage the container inventories at the port container terminals and Pugok but also support servicing customers and meet their needs efficiently. In any case, KMPA will retain important functions with respect to the port terminal and KNR will integrate the operation of container trains into the overall railway operations, so that systems of interaction between the container handling operations and the port/railway will be developed.

Implementation of the Plan of Action

The execution of the Plan of Action will have two phases. In the first phase, actions will be developed and carried out to solve the short-term problems (prior to 1990) and a general plan for organization and management of the port and railway container handling operations in the longer term should be studied and decisions as to what items to adopt will be taken. In the second phase, detailed plans will be made for the implementation of the systems decided upon and the actual implementation carried out.

In order to achieve the objectives of the plan, the flow of container traffic into, out of, and within Korea will be thoroughly analyzed. Operations, attitudes and future plans of users of the system and transport

companies (land and sea) will be carefully investigated and understood. Worldwide container traffic developments and trends will be studied. Traffic projections by origin and destination will be prepared. Most of the information needed is being assembled under the Study on Improvement of the Freight Transport System now being carried out by Korea Transport Institute (KTI) for the Ministry of Transport. Any additional studies needed might be added to the ongoing study. Any other studies undertaken will utilize the results of the KTI study so as to avoid duplication of effort. In any case where the projected traffic exceeds existing and newly provided capacity, alternative means of handling the traffic will be explored. The greater use of other ports, including Inchon will be considered. Operational improvements at the PCTOC Terminal, including possible use of equipment destined for the new terminal before it can be used there, will be investigated. Tariff adjustments to induce more efficient use of existing KMPA facilities will be considered.

Consideration was given to the organization and coordination of the preparation and execution of the Plan of Action. In view of the relatively independent agencies involved, a committee composed of senior representatives of KMPA, KNR, and the city of Pusan, chaired by a representative of the Ministry of Transportation was selected as the appropriate arrangement. In any event, active participation of the Ministry is needed not only to assist in coordination but also because it is managing the KTI Study which will provide essential support to execution of this Plan of Action. The high level committee will be backed up by a working level group composed of representatives of the Ministry and the other entities. MOT Transport Coordination Bureau (or KMPA) are being considered as a secretariat and management agency for the Plan.

Some of the necessary actions will be planned and carried out by in-house personnel of the agencies involved, but outside assistance will be needed in some areas. Whenever qualified Korean personnel are available, priority will be given to them; expatriate personnel will be engaged only when local experience and expertise is inadequate. List of actions to be carried out by each of the agencies are in Appendices 2, 3 and 4.

Quantitative Targets

In order to execute the plan, the main objectives to be reached to improve inland container transport have been quantified as targets that can be easily monitored, and revised, if necessary (see Appendix 1).

Schedule of Execution of Plan of Action

The steps to implement the plan are as follows:

Completion of study by PCTOC of the utilization of CY and CFS	December 1985
Establishment of Coordination Committee (MOT, KMPA, KNR, etc.)	June 1986
Drafting of Terms of Reference for Operational Studies to be carried out by Technical Assistance	June-July 1986
Completion of KTI study	November 1986
Engagement of Technical Assistance Experts	January-February 1987
First Phase of Plan:	
(a) Development of short-term measures and Government decisions	September 1986-June 1987
(b) Study by KNR and City of Pusan of relief of road/rail interference.	October 1986-March 1987
(c) Preparation of Plan for Dong Myung CY	January-April 1987
(d) Development of general plans for organization and management of container operations, Port and Rail	September 1986-June 1987
Government decisions on general plans	July-August 1987
Study of road access to outer-harbor area	March-December 1987
Second Phase of Plan:	
(a) Development of detailed plans for execution of Government decisions	September 1987-February 1988
(b) Implementation of detailed plans	March 1988-December 1989
(c) Monitoring results and fine tuning of procedures.	January 1990-December 1992

KOREA

PUSAN PORT PROJECT

APPENDICES OF DRAFT GOVERNMENT PROPOSED ACTION PLANS

TO IMPROVE KOREA'S INLAND CONTAINER HANDLING OPERATIONS

Quantitative Targets

In order to execute the plan, the main objectives to be reached to improve inland container transport have been quantified as targets that can be easily monitored. These targets, which are set forth below provide appropriate initial goals, but the targets should be reviewed annually and, if necessary, revised. The assumptions used are detailed in the attachment. (Except as otherwise indicated, units are 1000 TEU's handled per year.)

	Estimated	Targets					
	1985	1987	1988	1989	1990	1991	1992
Pusan Port Container Terminals /a							
Loaded on ships (exports)	373	458	519	585	657	761	846
Unloaded from ships (imports)	344	423	479	541	607	703	780
Maximum stacked in On-Dock CY /b	11	12	14	18	25	29	32
Stuffed in On-Dock CFS	11	73	106	114	122	129	141
Stripped in On-Dock CFS	3	22	22	24	32	37	41
Shipped by railway	56	81	97	119	145	174	205
Received by railway	29	64	86	109	133	161	189
Pusan Off-Dock CY's							
Stuffed	141	87	35	0	0	0	0
Stripped	42	28	19	0	0	0	0
Maximum stacked /b	30	24	15	8	0	0	0
KNR							
Container trains per day (each way)	5	5	6	8	9	11	13
Capacity per train (TEU)	44	44	44	44	44	44	44
Pugok terminal-unloaded from trains	56	81	97	119	145	174	205
Loaded on trains	29	64	86	109	133	161	189
Stuffed	0	20	34	43	49	59	66
Stripped	0	3	5	12	14	16	19
Maximum stacked /b	2	3	4	5	8	10	11

/a Includes Piers 5 and 6 and proposed Outer Harbor container terminal.
/b Number of containers stacked at any time; this is the one-time storage capacity required to handle peak requirements.

Assumptions for Calculating Targets

A. Containers Handled through Pusan Port

	1985 (actual)	1987	1988	1989	1990	1991	1992
		(---------- projected ----------)					
Totals (1000 TEU)	1,173	1,381	1,498	1,626	1,764	1,914	2,048
Handled piers 1-4	456	500	500	500	500	450	450
Handled by PCTOC:	(717)	(881)	(998)	(1,126)	(1,264)	(1,464)	(1,598)
at Piers 5 and 6	717	881	998	1,126	964	984	948
at New CT	-	-	-	-	300	540	650

Total TEU handled is based on an annual growth in container traffic of 8.5%. Breakdown is based on following theoretical capacities: Pier 1-4 -- 500,000, Piers 5-6 -- 720,000, new CT 540,000. Container movements are 52% exports, 48% imports; of these 5% of exports and 19% of imports are empties.

B. Stacking

Although reliable data are not available it appears that container stacking requirements average about three days for containers being imported, two for those being exported and fifteen days for empty containers awaiting export cargo. In order to accomodate peak requirements, storage space should be available to handle 130% of the average. Thus the required storage space in TEU is

$$1.3\ [0.48(3) + 0.52(15+2)]\ T\ /365 = 0.037T$$

Where T is the annual total traffic in TEU. Using this formula and the following storage areas, the containers stored in each area can be projected.

	CY Area (M^2)
Piers 5-6	257,000
New outer-harbor CT	120,000
Pugok	130,000
Dong Myung & Log Pond	400,000
Off-Dock CY	1,017,089

	Projected Maximum Containers Stacked (1000 TEU)						
	1985	1987	1988	1989	1990	1991	1992
Total	43	51	55	60	65	71	77
Piers 5-6	11	12	14	18	20	20	22
New CT	-	-	-	-	5	9	10
Pugok	2	3	4	5	8	10	11
Dong Myung/Log Pond	-	12	22	29	32	32	34
Off-Dock	30	24	15	8	0	0	0

C. Stuffing & Stripping

From data contained in the detailed Engineering, approximately 25% of containers exported and 8% of containers imported are stuffed or stripped in the CFS. To the extent practicable, traffic from and to the Seoul area should be stuffed or stripped at Pugok. Other traffic should be handled in the CFS serving the CY where the container is stored.

	Containers Stuffed (1000 TEU per annum)						
	1985	1987	1988	1989	1990	1991	1992
Total	152	180	195	211	229	249	270
Piers 5-6	11	73	106	114	100	100	100
New CT	-	-	-		22	29	41
Pugok	-	20	34	43	49	59	66
Dong Myung	-	-	20	54	58	61	63
Off-dock CY	141	87	35	0	0	0	0

	Containers Stripped (1000 TEU per annum)						
	1985	1987	1988	1989	1990	1991	1992
Total	45	53	58	62	68	73	80
Piers 5-6	3	22	22	24	24	24	24
New CT	-	-	-	-	8	13	17
Pugok	-	3	5	12	14	16	19
Dong Myung	-	-	12	26	22	20	20
Off-dock CY	42	28	19	0	0	0	0

D. Movement by Railway

The movement of containers by rail is only about 32% of the total Pusan-Seoul traffic and 14% of the Seoul-Pusan in 1985. It is desirable to increase these percentages but a reasonable build-up period should be anticipated as illustrated in the following table.

FORECAST OF KNR'S SHARE OF SEOUL-PUSAN CORRIDOR - CONTAINER TRANSPORT
(unit '000 TEU)

	Actual 1985	Forecast 1987	1988	1989	1990	1991	1992
Throughput at Pusan Port	1,173/a	1,381	1,498	1,626	1,764	1,914	2,048
To and From Seoul	377	483/b	524	569	617	670	716
Seoul-Pusan	206/c	261	283	307	333	362	387
Pusan-Seoul	178/d	222	241	262	284	308	329
Of Which By Rail:	85	145	183	228	278	335	394
Pugok-Pusan	29/e	64	86	109	133	161	189
Pusan-Pugok	56/f	81	97	119	145	174	205
KNR's Market Share (in %)							
To and from Seoul	22.5	30	35	40	45	50	55
Seoul-Pusan	14	24	30	36	40	44	48
Pusan-Seoul	32	36	40	45	51	56	62
KNR total 40' cars required per year in each direction (in '000)	28	40.5	48.5	59.5	72.5	87	102.5

/a 58% of Pusan traffic is outbound and 14.9% of the containers were empty; 42% of Pusan traffic is inbound and 23.5% of the containers were empty
/b Containers to and from Seoul are estimated to stay constant at 35% of total Pusan throughput.
/c Nearly all containers from Seoul to Pusan are full.
/d 40.3% of containers from Pusan to Seoul are empty.
/e 6% of containers by rail from Pugok to Pusan are empty.
/f 28% of containers by rail from Pusan to Pugok are empty.

The number of container to be transported per day and the number of cars and trains required in each direction is as follows, based on 365 days of operation per year.

KNR CONTAINER TRAFFIC FORECAST

	1985	1987	1988	1989	1990	1991	1992
No. of TEU/Day	233	397	501	625	762	918	1,079
Pugok-Pusan	79	175	235	300	366	441	518
Pusan-Pugok	154	222	266	325	396	477	561
No. of Train/Day							
@ 22 cars	10	10	12	16	18	22	26
Pugok-Pusan	3	4	6	7	9	10	12
Pusan-Pugok	5	5	6	8	9	11	13

Actions to be Carried Out by KMPA

Short-Term

Action

1. Increase utilization of PCTOC CFS and CY. Being studied by PCTOC.
2. Improve access procedures to PCTOC rail terminal.
3. Increase through capacity of PCTOC Terminal
4. Develop plan for providing and operating CY at Dong Myung.
5. Study measures to extend PCTOC overall storage capacity including the concept of inland dry ports
6. Expand capacity of PCTOC Rail Terminal by improving layout

Longer Term

Action

1. Develop organization and management plan for Pusan new (outer-harbor) container terminal.

Actions to be Carried Out by KNR

Short Term Actions

1. Operate trains initially without increase in length, speed and frequency between Pusan-Seoul by introducing a round trip per train per day.

2. Improve access procedures to Pugok Terminal so that all shippers can use it conveniently.

3. Improve utilization of Pugok CFS.

4. Use PCTOC Rail Terminal to form and receive all Seoul Container Trains.

5. Integrate Pugok CY operations with PCTOC using the same computerized system.

Longer Term Actions

1. Further increase capacity; reduce costs and tariffs of container service between Seoul and Pusan by increasing train length and speed.

Actions to be Carried out Jointly by Two or More Agencies

	Action	Agencies	Remarks
1.	Improve road access to existing and planned on-dock and Dong Myung CY's.	KMPA-City of Pusan	Study to be financed under Bank Loan.
2.	Reduce interference of road and rail traffic at entrance to PCTOC container handling rail spur.	undetermined	To be decided by Steering Committee
3.	Design and establish management and marketing system for container services of KNR, PCTOC and new Outer-harbor Terminal	KMPA-KNR Ministry of Transport	Study to be financed under Bank loan.

KOREA

PUSAN PORT PROJECT

Growth Trend of Domestic Freight Traffic (1966-84)
(Units: 1,000 tons; million tons-km)

	1966		1962-66	1971		1967-71	1976		1972-76	1981		1977-81	1982		1983		1984	
	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	Traffic volume	% share	Traffic volume	% share
Tonnage																		
Railways	24,064	46.9	9.4	31,955	25.1	5.8	43,629	17.8	6.4	48,761	12.1	2.2	47,437	11.0	50,478	9.9	53,661	9.8
Highways																		
Commercial	N/A	-	-	73,934	58.0	-	93,751	38.2	4.9	104,256	26.0	2.1	108,576	25.2	126,403	25.0	143,629	26.3
Private & gov't.	N/A	-	-	10,320	8.1	-	94,439	38.4	55.7	226,547	56.4	19.1	247,575	57.6	299,808	59.3	315,910	57.6
Subtotal	24,528	47.8	9.9	84,254	66.1	28.0	188,190	76.6	174.4	330,803	82.4	11.9	356,151	82.8	476,689	94.2	513,200	94.2
Maritime	2,686	5.3	13.2	11,263	8.8	33.2	13,829	5.6	4.2	22,206	5.5	9.9	26,454	6.2	29,086	5.8	31,731	5.8
Aviation	-	-	-	7	-	49.1	5	-	(5.7)	18	-	28.5	30	-	43	-	58	-
Total	51,278	100.0	9.8	127,479	100.0	20.0	245,653	100.0	5.2	401,788	100.0	10.3	430,072	100.0	505,818	100.0	544,789	100.0
Tons-km																		
Railways	5,450	81.6	9.3	7,841	48.9	7.5	9,728	44.6	4.4	10,815	37.5	2.2	10,892	36.9	11,629	33.6	12,033	32.3
Highways																		
Commercial	N/A	-	-	3,302	20.6	-	4,374	20.0	5.8	4,868	16.9	2.2	5,097	17.2	5,943	17.2	6,762	18.2
Private & gov't.	N/A	-	-	237	1.5	-	2,172	10.0	55.7	5,217	18.1	19.2	5,674	19.2	6,896	19.9	7,266	19.5
Subtotal	558	8.4	11.6	3,539	22.1	44.7	6,546	30.0	13.1	10,085	35.0	9.1	10,771	36.4	24,468	70.7	26,061	70.0
Maritime	672	10.0	36.7	4,653	29.0	50.2	5,533	25.4	3.5	7,927	27.5	7.5	7,881	26.7	10,099	29.2	11,141	30.0
Aviation	-	-	-	2	-	-	2	-	(2.5)	7	-	26.5	11	-	17	-	22	-
Total	6,680	100.0	11.1	16,035	100.0	19.1	21,809	100.0	6.4	28,834	100.0	5.8	29,555	100.0	34,584	100.0	37,224	100.0

Sources: (1) Fifth Five-Year Economic and Social Development Plan, Transportation Sector Plan (1982-86), December 1981, Transportation Sector Planning Task Force, MOT, Korea, pp. 2-3.
(2) Statistical Yearbook of Transportation - 1981, MOT, Korea, pp. 111, 113, 155, 157.
(3) Statistical Yearbook of Transportation - 1973, MOT, Korea, pp. 76-77, 101.
(4) Statistical Yearbook of Transportation - 1985, MOT, Korea, pp. 10-11, 169, 171.
(5) Mission to Korea.

KOREA

PUSAN PORT PROJECT

Growth Trend of Domestic Passenger Traffic (1966-84)
(Units: 1,000 passengers; million pass-km)

	1966		1962-66	1971		1967-71	1976		1972-76	1981		1977-81	1982		1983		1984	
	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	% increase	Traffic volume	% share	Traffic volume	% share	Traffic volume	% share
Passengers																		
Railways																		
Rail intercity	138,299	8.3	9.4	128,139	4.1	(1.5)	148,562	2.8	3.0	172,765	1.9	10.7	161,548	1.6	153,710	1.5	147,122	1.4
Seoul suburban	N/A	-	-	N/A	-	-	100,107	1.9	-	268,364	2.9	13.1	282,062	2.9	315,713	3.0	341,939	3.1
Subtotal	138,299	8.3	9.4	128,159	4.1	(1.5)	248,669	4.7	14.2	441,129	4.8	12.2	443,570	4.5	469,423	4.5	489,061	4.5
Subway	-	-	-	-	-	-	33,914	0.6	-	88,326	1.0	21.1	89,298	0.9	115,623	1.1	212,637	1.9
Highways																		
Intercity	277,078	16.7	-	339,886	10.7	4.2	651,624	12.2	13.9	910,657	9.9	7.0	978,402	10.0	969,279	9.3	947,246	8.6
Urban	1,234,480	74.6	-	2,684,343	85.0	16.8	4,399,359	82.4	10.4	7,772,473	84.2	12.0	8,280,850	84.5	8,932,045	85.0	9,253,373	84.8
Subtotal	1,511,558	91.3	20.8	3,024,229	95.7	14.9	5,050,983	94.6	10.8	8,683,130	94.1	11.4	9,259,252	94.5	9,901,324	94.3	10,200,619	93.4
Maritime	5,909	0.4	9.6	6,371	0.2	1.5	5,994	0.1	(1.2)	9,230	0.1	9.0	9,602	0.1	8,979	0.1	9,371	0.1
Aviation	192	-	25.4	1,105	-	44.8	795	-	(6.8)	1,555	-	14.4	1,844	-	2,363	0.0	2,869	-
Total	1,655,958	100.0	19.5	3,159,864	100.0	13.8	5,340,355	100.0	11.1	9,223,370	100.0	11.5	9,803,566	100.0	10,497,712	100.0	10,914,557	100.0
Pass-km																		
Railways																		
Rail intercity	8,665	42.5	10.0	8,750	27.1	0.2	12,441	21.2	7.3	16,552	18.2	5.8	15,838	16.5	16,063	16.1	15,961	15.6
Seoul suburban	N/A	-	-	N/A	-	-	1,864	3.2	-	4,976	5.4	21.7	5,196	5.5	5,625	5.7	5,923	5.8
Subtotal	8,665	42.5	10.0	8,750	27.1	0.2	14,305	24.4	10.3	21,528	23.6	8.5	21,034	22.0	21,688	21.8	21,884	21.4
Subway	-	-	-	-	-	-	388	0.7	-	1,258	1.4	26.5	1,309	1.4	1,556	1.6	2,310	2.2
Highways																		
Intercity	N/A	-	-	11,936	37.0	-	25,030	42.7	16.0	35,559	39.0	7.3	38,211	39.9	38,418	38.6	38,723	37.9
Urban	N/A	-	-	10,981	34.1	-	18,369	31.3	10.8	31,756	34.9	11.6	33,899	35.4	36,399	36.6	37,675	36.9
Subtotal	11,464	56.2	19.9	22,917	71.1	14.9	43,399	74.0	13.6	67,315	73.9	9.2	72,110	75.3	74,817	75.2	76,398	74.8
Maritime	196	1.0	7.6	256	0.8	5.5	249	0.4	(0.6)	480	0.5	14.0	610	0.6	557	0.6	581	0.6
Aviation	55	0.3	25.0	314	1.0	41.7	276	0.5	(2.6)	557	0.6	15.1	654	0.7	840	0.9	1,012	1.0
Total	20,380	100.0	15.0	32,237	100.0	9.6	58,617	100.0	12.7	91,138	100.0	9.2	95,717	100.0	99,458	100.0	102,185	100.0

Sources: (1) Fifth Five-Year Economic and Social Development Plan, Transportation Sector Plan (1982-86), December 1981, Transportation Sector Planning Task Force, MOT, Korea, pp. 2-3.
(2) Statistical Yearbook of Transportation - 1981, MOT, Korea, pp. 16-17, 60-63, 110-113.
(3) Statistical Yearbook of Transportation - 1973, MOT, Korea, pp. 76-77.
(4) Statistical Yearbook of Transportation - 1985, MOT, Korea, pp. 8-9, 121-123.
(5) Mission to Korea.

KOREA

PUSAN PORT PROJECT

Forecast for Domestic Freight Transport (1980-86) /a

	1980			1981			1982			1983			1984			1985			1986			1982-86 average growth	1986-80 multiplier
	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth		
Tons ('000)																							
Railways	49,008.0	28.4	(3.7)	51,275.0	28.1	4.5	53,680.0	27.5	4.8	56,161.0	26.9	4.6	58,916.0	26.3	4.9	61,933.0	25.8	5.1	65,386.0	25.4	5.6	5.00	1.33
Highways	104,526.0	60.3	(26.1)	110,826.0	60.8	6.0	119,573.0	61.4	7.9	129,391.0	62.0	8.2	139,995.0	62.6	8.2	151,495.0	63.1	8.2	163,870.0	63.5	8.2	8.14	1.57
Maritime	19,230.0	11.1	-	20,215.0	11.1	5.1	21,589.0	11.1	6.8	23,124.0	11.1	7.1	24,790.0	11.1	7.2	26,603.0	11.1	7.3	28,537.0	11.1	7.3	7.14	1.48
Aviation	12.8	-	(7.9)	13.4	-	4.7	14.3	-	6.7	15.3	-	7.0	16.4	-	7.2	17.7	-	7.9	19.0	-	7.3	7.23	1.48
Total	172,776.8	100.0	(18.4)	182,279.4	100.0	5.5	194,856.0	100.0	6.9	208,691.3	100.0	7.1	223,717.4	100.0	7.2	240,048.7	100.0	7.3	257,812.0	100.0	7.4	7.18	1.49
Tons-km (mln)																							
Railways	10,798.0	46.6	(2.6)	11,267.0	46.3	4.3	11,756.0	45.5	4.3	12,329.0	44.9	4.9	12,938.0	44.3	4.9	13,603.0	43.6	5.1	14,357.0	43.1	5.5	4.97	1.33
Highways	4,920.0	21.2	(36.4)	5,235.0	21.6	6.4	5,780.0	22.3	8.0	6,246.0	22.8	9.4	6,818.0	23.3	9.2	7,461.0	23.9	8.4	8,153.0	24.4	9.3	9.26	1.66
Maritime	7,463.0	32.2	(0.7)	7,815.0	32.1	4.7	8,312.0	32.2	6.4	8,876.0	32.3	6.8	9,480.0	32.4	6.8	10,100.0	32.5	6.9	10,836.0	32.5	7.0	6.75	1.45
Aviation	5.1	-	2.0	5.3	-	3.9	5.8	-	9.4	6.2	-	4.9	6.7	-	8.1	7.5	-	11.9	8.0	-	6.7	8.58	1.57
Total	23,186.1	100.0	(8.3)	24,322.3	100.0	4.9	25,853.8	100.0	6.0	27,457.2	100.0	6.5	29,242.7	100.0	6.5	31,171.5	100.0	6.7	33,354.0	100.0	6.9	6.52	1.44

/a Figures in parentheses indicate negative growth.

Source: "Draft" for preparation of Fifth Five-Year Social and Economic Plan (Transport Sector), August 1981, MOT, Korea, p. 18.

KOREA

PUSAN PORT PROJECT

Forecast for Domestic Passenger Transport (1980-86) /a

	1980			1981			1982			1983			1984			1985			1986			1982-86 average growth	1986-80 multiplier
	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth	Volume	% share	% growth		
Passengers ('000)																							
Railways	430,773	5.0	1.7	470,754	5.2	9.3	523,873	5.3	11.3	585,856	5.5	11.8	650,931	5.6	11.1	721,065	5.7	10.8	793,702	5.8	10.1	11.01	1.84
Subways	65,076	0.8	(2.1)	102,200	1.1	57.0	113,515	1.2	11.1	181,405	1.7	59.8	363,905	3.1	100.6	805,555	6.4	121.4	962,140	7.1	19.4	56.59	14.78
Highways	8,039,006	94.1	5.6	8,525,291	93.6	6.0	9,216,447	93.4	8.1	9,954,056	92.7	8.0	10,607,368	91.2	6.6	11,060,434	87.8	4.3	11,869,642	87.0	7.3	6.83	1.48
Maritime	8,580	0.1	8.2	9,006	0.1	5.0	9,329	0.1	3.6	9,772	0.1	4.7	10,253	0.1	4.9	10,826	0.1	5.7	11,441	0.1	5.7	4.90	1.33
Aviation	1,481	-	(18.3)	1,629	-	10.0	1,753	-	7.6	1,941	-	10.7	2,146	-	10.6	2,395	-	11.6	2,672	-	11.6	10.40	1.80
Total	8,544,916	100.0	5.4	9,108,880	100.0	6.6	9,864,917	100.0	8.3	10,733,030	100.0	8.8	11,634,603	100.0	8.4	12,600,275	100.0	8.3	13,633,597	100.0	8.2	8.40	1.60
Pass-km (million)																							
Railways	21,640	24.7	1.2	23,401	24.9	8.1	25,654	25.2	9.6	28,177	25.5	9.8	31,004	25.7	10.0	33,958	25.9	9.5	36,990	26.1	8.9	9.59	1.71
Subways	926	1.1	2.4	1,362	1.4	47.1	1,517	1.5	4.4	2,227	2.0	46.8	4,084	3.4	83.4	8,162	6.2	99.9	9,745	6.9	19.4	48.92	10.52
Highways	64,131	73.1	1.3	68,247	72.6	6.4	73,669	72.3	7.9	74,210	71.5	7.5	84,172	69.8	6.3	87,391	66.8	3.8	93,115	65.9	6.5	6.41	1.45
Maritime	401	0.5	3.9	426	0.5	6.2	443	0.4	4.0	464	0.4	0.7	489	0.4	5.4	516	0.4	5.5	549	0.4	6.4	5.20	1.37
Aviation	528	0.6	(17.0)	587	0.6	11.2	638	0.6	8.7	710	0.6	11.3	788	0.7	11.0	876	0.7	11.2	976	0.7	11.4	10.70	1.85
Total	87,626	100.0	2.6	94,023	100.0	7.3	101,921	100.0	8.4	105,788	100.0	8.7	120,537	100.0	8.8	130,903	100.0	8.6	141,375	100.0	8.0	8.50	1.61

/a Figures in parentheses indicate negative growth.

Source: "Draft" for preparation of Fifth Five-Year Social and Economic Plan (Transport Sector), August 1981, MOT, Korea, p. 17.

Table 1.5

KOREA

PUSAN PORT PROJECT

Demand for International Transport (1980-86)

	Passenger ('000)			Tons ('000)		
	Maritime	Aviation	Total	Maritime	Aviation	Total
1980 (%)						
Traffic	41.0	2,922.0	2,963.0	94,025.0	191.0	94,226.0
Share	1.4	98.6	100.0	99.8	0.2	100.0
Growth	(4.7)	(2.2)	(2.3)/a	3.5	14.0	3.6
1981 (%)						
Traffic	43.0	3,086.0	3,125.0	102.000.0	207.2	102,207.2
Share	1.4	98.6	100.0	99.8	0.2	100.0
Growth	4.9	5.6	5.5	8.5	8.5	8.5
1982 (%)						
Traffic	44.0	3,545.0	3,589.0	112,051.0	243.1	112,294.1
Share	1.2	98.6	100.0	99.8	0.2	100.0
Growth	2.3	14.9	14.8	9.9	17.3	9.9
1983 (%)						
Traffic	46.0	4,120.0	4.166.0	122,644.0	286.5	122,930.5
Share	1.1	98.9	100.0	99.8	0.2	100.0
Growth	4.5	16.2	16.1	9.5	17.9	9.5
1984 (%)						
Traffic	49.0	4,787.0	4,836.0	134.584.0	338.0	134,922.0
Share	1.0	99.0	100.0	99.7	0.2	100.0
Growth	6.5	16.2	16.1	9.7	18.0	9.8
1985 (%)						
Traffic	52.0	5,587.0	5,639.0	149,115.0	400.0	149,515.0
Share	0.9	99.1	100.0	99.7	0.3	100.0
Growth	6.1	16.7	16.6	10.8	18.3	10.8
1986 (%)						
Traffic	55.0	6,520.0	6,575.0	164,941.0	474.0	165,415.0
Share	0.8	99.2	100.0	99.7	0.3	100.0
Growth	5.8	16.7	16.6	10.6	18.5	10.6
1982-86 Average growth	5.05	16.14	16.04	10.09	18.00	10.12
1986-80 Multiplier	1.34	2.23	2.22	1.75	2.48	1.76

/a Figures in brackets () indicate negative growth.

Source: "Draft" for preparation of Fifth Five-Year Social and Economic Plan-Transport Sector. August 1981, MOT, Korea, p.19

Table 1.6

KOREA

PUSAN PORT PROJECT

Comparison of Investment Plans (1977-81 and 1982-86)
(Billion won)

Transport investment	The Fourth Plan (1977-81) /a /c				The Fifth Plan (1982-86) /b			
	Investment requirements				Investment requirements			
	Domestic capital	Foreign capital (US$ mln)	Total	Composition ratio (%)	Domestic capital	Foreign capital (US$ mln)	Total	Composition ratio (%)
Railway	289.9 (719.0)	231.7 (574.6)	402.1 (997.2)	14.5	894.3	715.6	1,330.8	13.4
Highway	1,141.0 (2,829.7)	174.9 (433.8)	1,225.6 (3,039.5)	44.0	3,568.9	245.8	3,718.8	37.4
Road /d	373.1 (925.3)	174.9 (451.2)	457.8 (1,135.3)	16.4	1,175.0	220.8	1,309.7	13.2
Vehicles /e	741.2 (1,838.2)	- (-)	741.2 (1,838.2)	26.6	2,307.6	-	2,307.6	23.2
Others	26.6 (66.0)	- (-)	26.6 (66.0)	1.0	86.3	25.0	101.5	1.0
Ports and ships	557.4 (1,382.4)	902.3 (2,237.7)	994.1 (2,465.4)	35.7	1,693.2	1,576.9	2,655.1	26.7
Ships	358.8 (889.8)	773.6 (1,918.5)	733.3 (1,818.6)	26.3	1,228.6	1,365.2	2,061.4	20.7
Ports and facilities	200.6 (497.5)	128.7 (319.2)	260.8 (646.8)	9.4	464.5	211.7	593.7	6.0
Aviation	51.4 (127.5)	15.5 (38.4)	58.9 (146.1)	2.1	175.4	687.0	594.5	6.0
Subway	54.1 (134.2)	97.0 (240.6)	101.0 (250.5)	3.6	1,324.5	509.8	1,635.0	16.5
Waterway	1.9 (4.7)	- -	1.9 (4.7)	0.1	5.0	-	5.0	-
Total	2,095.7 (5,197.5)	1,421.4 (3,525.1)	2,783.6 (6,903.4)	100.0	7,661.3	3,735.1	9,939.7	100.0
Total capital expenditure	14,188.0 (35,186.2)	10,000.0 (24,800.0)	19,028.0 (47,189.4)		59,000.0	23,673.4	72,100.0	
Total transport investment as % of total capital expenditure	14.8	14.2	14.6		13.0	15.8	13.8	

/a The Fourth Plan figures are in 1975 constant value.

/b The Fifth Plan figures are in 1980 constant value.

/c The figures in parentheses indicate the 1980 constant value.

/d Including construction, repair and loan repayment of national roads only.

/e Including new vehicles additional to the fleet and replacements for scrapped vehicles.

Note: GNP deflator: 1975 = 100, 1980 = 247.9.

Sources: (1) The Fourth Five-Year Economic Development Plan (1977-81), EPB, Korea, 1976, pp. 140-141, 152-153.

(2) The Fifth Five Year Economic and Social Development Plan - Transport Part for Implementation (1982-86), MOT, Korea, October 1981, p. 51.

(3) Transport Part of the Investment Plan, EPB, Korea, October 12, 1981, pp. 8, 17, 26.

Table 2.1

KOREA

PUSAN PORT PROJECT

Korean Ports System

Commercial ports		Industrial ports	Fishing ports			Others
1st class	2nd class		1st class	2nd class	3rd class	Without basic facilities
Pusan	Yeongpyeongdo	Pohang				
Inchon	Gwangcheon	Changwon				
Kunsan	Daecheon	Onsan				
Mokpo	Daeheugsando	Bukpyung				
Yesu	Biin	Yochun				
Masan	Geomundo					
Ulsan	Narodo	Okpo				
Mukho	Hanrim	Kwang Yang				
Cheju	Seongsanpo	Pyongtak				
Changhang	Hwansun					
Seogwipo	Gujora					
Chungmu	Pusan Southern Port					
Samchonpo	Gampo					
Chinhae	Guryongpo					
Jangseungpo	Weolpo					
Okpo	Gangu					
Pohang	Dodong					
Samil	Hupo					
Bukpyong	Jugbyeon					
Sogcho	Imwon					
Samchok	Jumunjin					
Wando	Geojin					
Gojung						
Gohyeun						
Total 24	22	8	37	355	24	1,409
Grand Total	1,869			416		

Source: Statistics Yearbook of Maritime and Ports 1985, p. 419 (industrial ports: MOC).

KOREA

PUSAN PORT PROJECT

Ports Cargo Handling Capacities (1961-84)
('000 MT)

	1961	1966	1971	1976	1980	1981	1982	1983	1984
General Ports									
Pusan	3,950	4,990	5,740	7,000	14,000	15,000	19,600	19,600	19,600
Incheon	1,300	1,420	1,720	8,720	8,720	9,728	11,728	12,066	12,595
Kunsan	520	540	540	540	1,540	1,540	1,540	1,540	1,540
Mokpo	320	443	443	515	515	1,000	1,000	1,320	1,320
Yosu	610	681	698	2,998/a	4,722	5,722	6,718	6,718	7,718
Masan	670	670	703	1,433	2,033	3,030	3,630	3,630	3,630
Ulsan	-	500	1,312	1,466	2,390	2,657	2,657	2,657	3,062
Mukho	980	2,450	4,420	4,500	6,500	6,580	6,548	6,565	6,620
Cheju	150	150	236	593	800	843	843	843	843
Others /b	160	2,446	2,909	1,210	5,465	8,234	449	579	3,709
Subtotal	8,660	14,290	18,421	28,975	46,685	54,334	54,713	55,518	60,637
Industrial Ports									
Pohang	360	360	360	5,025	22,160	24,175	24,175	25,775	31,431
Pukpyung	-	-	-	-	8,914	8,914	8,914	11,314	12,000
Others /c							7,710	7,710	8,710
Subtotal	360	360	360	5,025	32,230	33,089	40,799	44,799	52,141
Grand Total	9,020	14,650	18,781	34,000	78,915	87,423	95,512	100,317	112,778

/a Cargo Handling Capacity of Samil Port are included with Yosu Port.

/b Includes also industrial ports until 1981.

/c Changwon, Onsan, Yochun.

Sources: Statistics yearbook of maritime and ports 1985, p. 412.

Table 2.3

KOREA

PUSAN PORT PROJECT

Korean Ports Cargo Traffic (1961-84)
('000 revenue tons)

Year	Entered			Cleared			Total		
	Ocean-going vessels	Coastal vessels	Sub-total	Ocean-going vessels	Coastal vessels	Sub-total	Ocean-going vessels	Coastal vessels	Total
1961	2,450	1,158	3,608	964	1,073	2,037	3,414	2,231	5,645
First FYP									
1962	3,700	1,489	5,189	803	1,593	2,395	4,503	3,082	7,585
1963	4,396	1,527	5,923	861	1,694	2,555	5,257	3,221	8,478
1964	4,163	1,598	5,761	1,061	1,912	2,973	5,224	3,510	8,734
1965	5,174	2,271	7,445	1,577	2,282	3,859	6,751	4,553	11,304
1966	6,772	2,406	9,178	1,663	2,184	3,847	8,435	4,590	13,025
Second FYP									
1967	9,732	4,186	13,923	1,786	4,159	5,945	11,523	8,345	19,868
1968	13,542	5,657	19,199	2,253	5,548	7,801	15,795	11,205	2,700
1969	17,109	8,063	25,172	2,891	8,164	11,055	20,000	16,227	36,227
1970	18,695	10,477	29,172	3,589	10,544	14,133	22,284	21,021	43,305
1971	24,257	11,264	35,521	4,192	11,261	15,453	28,449	22,525	50,974
Third FYP									
1972	24,699	8,916	33,615	6,010	8,657	14,667	30,709	17,573	48,282
1973	31,798	9,747	41,545	7,964	9,747	17,711	39,762	19,494	59,256
1974	33,830	10,827	44,657	8,258	10,827	19,085	42,088	21,654	63,742
1975	35,142	11,541	46,683	9,986	11,540	21,526	45,128	23,081	68,209
1976	41,447	13,532	54,979	14,311	13,532	27,843	55,757	27,064	82,822
Fourth FYP									
1977	51,498	15,816	67,314	16,814	15,816	32,830	68,312	31,632	99,944
1978	61,843	16,827	78,670	16,039	16,827	32,866	77,882	33,654	111,536
1979	72,992	18,759	91,751	17,828	18,759	36,587	90,820	37,518	128,338
1980	71,400	18,900	90,300	22,700	18,900	41,600	94,100	37,800	131,900
1981	79,000	21,850	100,850	26,300	21,850	48,150	105,300	43,700	149,000
Fifth FYP									
1982	80,938	25,981	106,919	27,569	25,981	53,550	108,507	51,962	160,469
1983	88,905	28,600	117,505	29,279	28,600	57,879	118,184	57,200	175,384
1984	95,119	31,315	126,434	30,617	31,315	61932	125,736	62,630	188,366
Average Annual Growth Rate (%)									
1962-67	12.8	10.1	12.1	15.7	6.5	9.9	13.4	8.3	11.4
1967-72	20.1	22.0	20.5	18.6	29.9	21.0	19.8	22.0	20.4
1972-77	10.9	8.7	10.3	19.0	9.4	13.7	12.7	9.0	11.4
1977-81	8.9	6.7	8.4	9.4	6.7	8.0	9.0	6.7	8.4
1981-84	6.4	12.7	7.8	5.2	12.7	8.7	6.1	12.7	8.1

Source: Statistics Yearbook of Maritime and Ports, 1985, pp. 342, 358.

Table 2.4

KOREA

PUSAN PORT PROJECT

Korea Ports Traffic and Forecast by Major commodities (1980-86)
(million revenue tons)

	1980 Actual	1984 Actual	1986 Forecast	1980-84 Average annual growth rate (%)
Grains (I)	5.5	7.1	6.0	2.2
Logs (I)	5.4	6.1	11.0	3.1
Fertilizer, raw material (I)	1.7	1.9	3.2	2.8
Coal (I, C)	11.0	5.4	29.6	-16.3
Cement (E, C)	10.4	13.5	15.0	6.7
Iron ore (I, C)	9.6	14.2	19.0	10.3
Iron & steel (I, E, C)	8.8	14.5	13.5	13.3
Minerals (I, E, C)	3.2	5.5	6.9	14.5
Containerized (I, E)	10.8	19.9	24.0	16.5
Break bulk (uncovered) (I, E, C)	10.8	18.4	24.2	14.2
Petroleum (I, C)	48.9	57.3	60.8	4.0
Subtotal	126.1	163.8	213.2	6.8
Others	5.8	24.6	10.1	45.9
Total	131.9	188.4	223.2	9.5

Note: I = Import, E = Export, C = Coastal trade.
Forecast will be revised by the end of 1985.

Source: KMPA.

Table 2.5

KOREA

PUSAN PORT PROJECT

Industrial Ports' Capacity (1984)
(Million metric tons)

Port	Type of cargo	Capacity	Cargo volume
Pukpyung	Cement, coal, miscellaneous	12.0	12.0
Pohang	Iron ore, coal, miscellaneous	31.5	31.5
Onsan	Oil	4.0	4.0
Ogpo	Shipbuilding	-	-
Changwon (Masan)	Machinery	2.9	2.9
Pyeongtaek	LNG	3.0	3.0
Yochun	Petrochemicals	5.8	5.8
Kwangyang Area (under construction)	Iron ore	40.3	40.3

Source: Ministry of Construction, Korea.

Table 3.1

KOREA

PUSAN PORT PROJECT

Existing Berths at Pusan

Terminal	Number of berths	Length (m)	Depth (m)	Cargo handled
Coastal passenger terminal	2	226	-	Passenger
International passenger and Ro-Ro terminal (south-side pier 1)	2	300	8.5	Passengers
Pier No. 1 (north side)	2	390	10.0	General cargo, containers
Pier No. 2	4	780	10.0	General cargo, containers
Pier No. 3	4/6	840	10.0/9.0	General cargo, containers
Pier No. 4	6	1,050	10.0/9.0	General cargo, containers
Piers No. 5 and 6	4	1,240	12.5	Containers
South	1	320	12.5	Grain
Pier No. 7	2	600	8.0	Coal, iron ore
Pier No. 8	1	260	9.0	Military
Central wharf	4/5	870	9.0	Lumber, general cargo
Lighter wharves between piers 1-2 and piers 3-4 and north of pier 4	Lighters	1,700	Shallow	General cargo

KOREA

Pusan Port Project

Korea's Container Traffic by Ports and Direction (1976-84)

(Unit: TEU)

Year	Pusan			Inchon			Total Korea		
	Inbound	Outbound	Subtotal	Inbound	Outbound	Subtotal	Inbound	Outbound	Subtotal
1976	164,348 (42.8)	186,413 (48.5)	350,761 (91.3)	14,882 (3.9)	18,484 (4.8)	33,366 (8.7)	179,230 (46.7)	204,897 (53.3)	384,127 (100.0)
1977	214,309 (43.0)	239,973 (48.2)	454,282 (91.2)	22,265 (4.5)	21,352 (4.3)	43,617 (8.8)	236,574 (47.5)	261,325 (52.5)	497,899 (100.0)
1978	234,016 (42.2)	272,540 (49.2)	506,556 (91.4)	26,064 (4.7)	21,501 (3.9)	47,565 (8.6)	260,080 (46.9)	294,041 (53.1)	554,121 (100.0)
1979	266,957 (41.8)	329,617 (51.6)	596,574 (93.3)	23,788 (3.7)	18,916 (3.0)	42,704 (6.7)	290,745 (45.5)	348,533 (54.5)	639,278 (100.0)
1980	256,142 (37.0)	376,724 (54.4)	632,866 (91.4)	32,949 (4.8)	26,609 (3.8)	59,558 (8.6)	289,091 (41.8)	403,333 (58.2)	692,424 (100.0)
1981	315,603 (38.3)	428,365 (51.9)	743,968 (90.2)	44,407 (5.4)	36,335 (4.4)	80,742 (9.8)	360,010 (43.7)	464,700 (56.3)	824,710 (100.0)
1982	348,460 (41.0)	438,196 (51.5)	786,656 (92.4)	35,051 (4.1)	29,198 (3.4)	64,249 (7.6)	383,511 (45.1)	467,394 (54.9)	850,905 (100.0)
1983	375,009 (39.0)	508,643 (52.9)	883,652 (91.8)	45,072 (4.7)	33,502 (3.5)	78,574 (8.2)	420,081 (43.7)	542,145 (56.3)	962,226 (100.0)
1984	423,906 (36.7)	630,424 (54.6)	1,054,330 (91.3)	62,371 (5.4)	38,017 (3.3)	100,388 (8.7)	486,277 (42.1)	668,441 (57.9)	1,154,718 (100.0)
Growth rate (%)	11.1	14.5	13.0	17.3	8.3	13.0	11.7	14.0	13.0

Note: Figures in brackets indicate percentage.

Source: KMPA, Year Book of Maritime and Port Statistics, 1985, p.377-379.

Table 3.3

KOREA

PUSAN PORT PROJECT

Throughput of Containers by Off-Dock Container Yards in the Pusan Area, 1984

Company	Containers handled (TEU)			Share of throughput by company (%)	Company area (m^2)
	Full	Empty	Total		
KCTC	65,594	11,876	77,470	7.4	97,177
Kukbo	60,069	7,851	67,920	6.5	57,458
Kukje	38,756	4,736	43,492	4.2	55,537
Kukje	16,029	2,518	18,547	1.9	17,891
FEMICO	19,180	2,503	21,683	2.1	29,744
Korean Express	77,700	8,296	85,996	8.3	81,090
Dong Bang	35,324	9,271	44,595	4.3	40,254
Dong Bo	18,769	9,673	28,442	2.7	31,862
Dong Jin	18,019	9,073	27,092	2.6	24,866
Samick	63,688	15,663	79,351	7.6	76,337
KSC	21,030	8,617	29,647	2.8	72,188
Global	117,571	25,083	142,654	13.7	139,486
Shinil	8,538	1,886	10,424	1.0	11,272
Ilsang	2,370	188	2,558	0.2	35,927
Chong Kung	35,280	15,483	50,763	4.9	61,000
Hanjin	68,957	10,768	79,725	7.7	96,124
Hypsung	63,640	19,778	83,418	8.0	88,876
PCTOC /a	125,144	22,047	147,191	14.1	87,575
Total	855,658	185,310	1,040,968	100.0	1,104,664

/a On-dock company.

Source: KMPA.

KOREA

Pusan Port Project

Korea's Container Traffic by Content and Direction (1976-84)

(Unit: TEU)

Year	Full Container			Empty Container			Total		
	Inbound	Outbound	Subtotal	Inbound	Outbound	Subtotal	Inbound	Outbound	Subtotal
1976	128,616 (33.5)	194,238 (50.6)	322,854 (84.0)	50,614 (13.2)	10,659 (2.8)	61,273 (16.0)	179,230 (46.7)	204,897 (53.3)	384,127 (100.0)
1977	181,090 (36.4)	242,018 (48.6)	423,108 (85.0)	55,484 (11.1)	19,307 (3.9)	74,791 (15.0)	236,574 (47.5)	261,325 (52.5)	497,899 (100.0)
1978	225,438 (40.7)	271,144 (48.9)	496,582 (89.6)	34,642 (6.3)	22,897 (4.1)	57,539 (10.4)	260,080 (46.9)	294,041 (53.1)	554,121 (100.0)
1979	256,632 (40.1)	290,722 (45.5)	547,354 (85.6)	34,113 (5.3)	57,811 (9.0)	91,924 (14.4)	290,745 (45.5)	348,533 (54.5)	639,278 (100.0)
1980	228,751 (33.0)	348,825 (50.4)	577,576 (83.4)	60,340 (8.7)	54,508 (7.9)	114,848 (16.6)	289,091 (41.8)	403,333 (58.2)	692,424 (100.0)
1981	280,851 (34.1)	409,432 (49.6)	690,283 (83.7)	79,159 (9.6)	55,268 (6.7)	134,427 (16.3)	360,010 (43.7)	464,700 (56.3)	824,710 (100.0)
1982	292,101 (34.3)	402,820 (47.3)	694,921 (81.7)	91,410 (10.7)	64,574 (7.6)	155,984 (18.3)	383,511 (45.1)	467,394 (54.9)	850,905 (100.0)
1983	328,902 (34.2)	446,590 (46.4)	775,492 (80.6)	91,179 (9.5)	95,555 (9.9)	186,734 (19.4)	420,081 (43.7)	542,145 (56.3)	962,226 (100.0)
1984	386,498 (33.5)	537,050 (46.5)	923,548 (80.0)	99,779 (8.6)	131,391 (11.4)	231,170 (20.0)	486,277 (42.1)	668,441 (57.9)	1,154,718 (100.0)
Growth rate (%)	13.0	11.9	12.4	7.8	32.1	15.9	11.7	14.0	13.0

Note: Figures in brackets indicate percentage.

Source: KMPA, Year Book of Maritime and Port Statistics, 1985, p.361-363.

KOREA

Pusan Port Project

Pusan Container Traffic by Content and Direction (1976-84)

(Unit: TEU)

Year	Full Container			Empty Container			Total		
	Inbound	Outbound	Subtotal	Inbound	Outbound	Subtotal	Inbound	Outbound	Subtotal
1976	115,517 (32.9)	182,211 (51.9)	297,728 (84.9)	48,831 (13.9)	4,202 (1.2)	53,033 (15.1)	164,348 (46.9)	186,413 (53.1)	350,761 (100.0)
1977	160,794 (35.4)	231,319 (50.9)	392,113 (86.3)	53,515 (11.8)	8,654 (1.9)	62,169 (13.7)	214,309 (47.2)	239,973 (52.8)	454,282 (100.0)
1978	199,986 (39.5)	261,739 (51.7)	461,725 (91.1)	34,030 (6.7)	10,801 (2.1)	44,831 (8.9)	234,016 (46.2)	272,540 (53.8)	506,556 (100.0)
1979	237,444 (39.8)	282,680 (47.4)	520,124 (87.2)	29,513 (4.9)	46,937 (7.9)	76,450 (12.8)	266,957 (44.7)	329,617 (55.3)	596,574 (100.0)
1980	201,028 (31.8)	336,968 (53.2)	537,996 (85.0)	55,114 (8.7)	39,756 (6.3)	94,870 (15.0)	256,142 (40.5)	376,724 (59.5)	632,866 (100.0)
1981	239,552 (32.2)	391,989 (52.7)	631,541 (84.9)	76,051 (10.2)	36,376 (4.9)	112,427 (15.1)	315,603 (42.4)	428,365 (57.6)	743,968 (100.0)
1982	259,599 (33.0)	388,985 (49.4)	648,584 (82.4)	88,861 (11.3)	49,211 (6.3)	138,072 (17.6)	348,460 (44.3)	438,196 (55.7)	786,656 (100.0)
1983	286,565 (32.4)	432,989 (49.0)	719,554 (81.4)	88,444 (10.0)	75,654 (8.6)	164,098 (18.6)	375,009 (42.4)	508,643 (57.6)	883,652 (100.0)
1984	328,850 (31.2)	518,368 (49.2)	847,218 (80.4)	95,056 (9.0)	112,056 (10.6)	207,112 (19.6)	423,906 (40.2)	630,424 (59.8)	1,054,330 (100.0)
Growth rate (%)	12.3	12.3	12.3	7.7	44.0	16.3	11.1	14.5	13.0

Note: Figures in brackets indicate percentage.

Source: KMPA, Year Book of Maritime and Port Statistics, 1985, p.367.

Table 3.6

KOREA

PUSAN PORT PROJECT

Origin/Destination of Container Traffic by Region in 1983
Unit: TEU

	Inchon				Pusan				Total		
	Inbound	Outbound	Subtotal	Shares (%)	Inbound	Outbound	Subtotal	Shares (%)	Inbound	Outbound	Total
Seoul	35,623	12,915	48,538	86.8	92,404	178,531	270,935	37.7	128,027	191,446	319,473
Gang Weon	5	-	5	-	1,724	241	1,965	0.3	1,729	241	1,970
Chuncheon	5	-	5		1,160	46	1,206		1,165	46	1,211
Weonju	-	-	-		7	-	7		7	-	7
Kangreung	-	-	-		557	195	752		557	195	752
Chung Bug	1,485	69	1,554	2.8	5,106	6,293	11,399	1.6	6,591	6,362	11,953
Cheongju	1,480	69	1,549		4,389	3,156	7,545		5,869	3,225	9,094
Chunnju	-	-	-		687	3,137	3,824		687	3,137	3,824
Jecheon	5	-	5		30	-	30		35	-	35
Chung Nam	3,206	94	3,300	5.9	29,366	13,380	42,746	5.9	32,592	13,474	46,046
Daejeon	2,776	94	2,870		24,707	11,922	36,629		27,483	12,016	39,499
Cheonan	430	-	430		4,654	1,419	6,073		5,084	1,419	6,503
Seosan	-	-	-		5	-	5		5	-	5
Hongseung	-	-	-		-	39	39		-	39	39
Jeon Bug	825	523	1,348	2.4	32,126	14,070	46,196	6.4	32,951	14,593	35,776
Jeonju	793	523	1,316		31,791	12,664	44,455		32,584	13,187	34,003
Jeongju	32	-	32		75	866	941		107	866	973
Namweon	-	-	-		260	540	800		260	540	800
Jeon Nam	154	-	154	0.3	9,276	12,220	23,496	3.3	11,430	12,220	23,650
Gwangju	154	-	154		7,686	3,644	13,330		9,840	3,644	13,484
Suncheon	-	-	-		1,485	6,638	8,123		1,485	6,638	8,123
Mogpo	-	-	-		95	1,913	2,008		95	1,913	2,008
Gangjin	-	-	-		10	25	35		10	25	35
Gyeong Bug	337	-	337	0.6	36,893	68,715	105,528	14.7	37,130	68,735	105,865
Daegu	337	-	337		33,670	66,645	100,215		33,907	66,645	100,552
Andong	-	-	-		24	72	96		24	72	96
Pohang	-	-	-		3,167	1,972	5,139		3,167	1,972	5,139
Yeongju	-	-	-		15	26	41		15	26	41
Jeomcheon	-	-	-		17	20	37		17	20	37
Gyeong Nam	-	-	-	1.2	3,584	3,261	6,845	9.5	521	3,261	6,845
Jinju	-	-	-		3,403	3,072	6,475		340	3,072	6,475
Geochang	-	-	-		181	189	370		181	189	370
Pusan	702	-	702		74,186	136,258	210,444	29.2	74,888	136,258	211,146
Total	42,337	13,601	55,938	100	286,565	432,989	719,554	100.0	328,902	446,590	775,492

Source: Kiri-Sekwang, Site selection Study of Container Terminal, April 1985. p.76.

KOREA

PUSAN PORT PROJECT

Containers Handled by KNR Between Pusan and Seoul (Pugok), 1985

	Full				Empty				Grand total	Empty car ratio (%)	No. of freight of cars
	40'	20'	10'	Total	40'	20'	10'	Total			
January											
Number	987	1,073	32	2,092	477	258	-	735	2,827	26	2,162
Tons	23,688	12,876	192	36,756	5,724	1,548	-	7,272	44,028		
February											
Number	642	1,132	29	1,803	307	168	-	475	2,278	21	1,630
Tons	15,408	13,584	174	29,166	3,684	1,008	-	4,692	33,858		
March											
Number	602	1,129	32	1,763	312	182	-	494	2,257	22	1,600
Tons	14,448	13,548	192	28,188	3,744	1,092	-	4,836	33,024		
April											
Number	580	1,570	26	2,176	366	374	-	740	2,916	25	1,950
Tons	13,920	18,840	156	32,916	4,392	2,244	-	6,636	39,552		
May											
Number	836	1,446	30	2,312	588	430	-	1,018	3,330	31	2,393
Tons	20,064	17,352	180	37,596	7,056	2,580	-	9,636	47,232		
June											
Number	1,042	1,295	22	2,359	440	356	-	796	3,155	25	2,332
Tons	25,008	15,542	132	40,680	5,280	2,136	-	7,416	48,096		
July											
Number	1,186	1,244	30	2,460	883	426	-	1,309	3,769	35	2,940
Tons	28,464	14,928	180	43,572	10,596	2,256	-	13,152	56,724		
August											
Number	1,117	1,176	37	2,330	564	520	-	1,084	3,414	32	2,569
Tons	26,808	14,112	222	41,142	6,768	3,120	-	9,888	51,030		
September											
Number	1,395	1,032	30	2,457	609	673	-	1,282	3,739	34	2,894
Tons	33,480	12,384	180	46,044	7,308	4,038	-	11,346	57,390		
October											
Number	908	1,028	30	1,966	760	542	-	1,302	3,268	40	2,493
Tons	21,792	12,336	180	34,308	9,120	3,252	-	12,372	46,680		
November											
Number	703	932	33	1,668	580	690	-	1,270	2,938	43	2,133
Tons	16,872	11,184	198	28,245	6,960	4,140	-	11,100	39,354		
December											
Number	982	928	30	1,940	762	896	-	1,658	3,598	46	2,690
Tons	23,568	11,136	180	34,884	9,144	5,376	-	14,520	49,404		
Total											
Number	10,981	13,984	361	25,326	6,648	5,515	=	12,163	37,489	32	27,786
Tons	263,544	167,808	2,166	433,518	79,776	33,090	=	112,866	546,384		

TEU	40':	17,629 x 2 =	35,258
	20':	19,499 =	19,499
	10':	361 ÷ 2 =	181
Total			54,983

Source: KNR, Pusan Station.

KOREA

PUSAN PORT PROJECT

Containers Handled by KNR Between Seoul (Pugok) and Pusan, 1985

	Full				Empty				Grand total	Empty car ratio (%)	No. of freight of cars
	40'	20'	10'	Total	40'	20'	10'	Total			
January											
Number	345	418	8	771	42	10	27	79	850	9	627
Tons	8,280	2,508	48	10,836	504	60	81	645	11,481		
February											
Number	526	651	3	1,180	221	81	23	425	1,605	26	1,141
Tons	12,624	7,812	18	20,454	2,652	486	69	3,207	23,661		
March											
Number	643	691	5	1,339	333	200	33	566	1,905	30	1,451
Tons	15,432	8,292	30	23,754	3,996	1,200	99	5,295	29,049		
April											
Number	498	431	7	936	88	90	28	206	1,142	18	871
Tons	11,952	5,172	42	17,166	1,056	540	84	1,680	18,846		
May											
Number	622	549	5	1,176	26	36	23	85	1,261	7	966
Tons	14,928	6,588	30	21,546	312	216	69	597	22,143		
June											
Number	807	643	2	1,452	94	14	23	131	1,583	8	1,244
Tons	19,368	7,716	12	27,096	1,128	120	69	1,317	28,413		
July											
Number	810	641	6	1,457	95	71	40	206	1,663	18	1,285
Tons	19,440	7,692	36	27,168	1,140	426	120	1,686	28,854		
August											
Number	1,012	651	7	1,670	80	53	26	159	1,829	9	1,477
Tons	24,288	7,812	42	32,142	960	318	78	1,356	33,498		
September											
Number	1,491	780	5	2,276	181	66	32	279	2,555	11	2,128
Tons	35,784	9,360	30	45,174	3,172	396	96	2,664	47,838		
October											
Number	724	635	5	1,364	33	39	27	99	1,463	7	1,124
Tons	17,376	7,620	30	25,026	396	234	81	711	25,737		
November											
Number	670	645	5	1,320	13	18	28	59	1,379	3	902
Tons	16,080	7,740	30	23,850	156	108	84	348	24,198		
December											
Number	1,104	1,021	7	2,132	34	48	24	106	2,238	5	1,707
Tons	26,496	12,252	42	38,790	408	288	72	768	39,558		
Total											
Number	9,252	7,756	65	17,073	1,240	726	334	2,400	19,474	12	14,923
Tons	222,048	90,564	390	313,002	14,880	4,392	1,002	20,274	333,276		

TEU	40':	10,492 X 2 =	20,984
	20':	8,482 =	8,482
	10':	399 ÷ 2 =	200
Total			29,666

Source: KNR, Pusan Station.

Table 4.1

KOREA

PUSAN PORT PROJECT

Project Cost Summary

(June 30, 1986)

	Total (mln. Won)			Total ('000 US)			Loan ('000 US$)	Foreign % of total base costs
	Local	Foreign	Total	Local	Foreign	Total		
A. Civil Works								
South breakwater	16,581	24,872	41,453	18,423	27,636	46,059	27,636	19.6
North breakwater	22,234	33,354	55,588	24,705	37,060	61,765	37,060	26.3
Dredging container terminal	3,594	5,391	8,985	3,993	5,990	9,983	5,990	4.3
Container terminal wharf	23,709	35,559	59,268	26,343	39,511	65,854	39,511	28.1
Access road and railway	20,421	5,128	25,549	22,690	5,698	28,388	5,698	4.0
T junction	1,800	2,700	4,500	2,000	3,000	5,000	-	0.0
Caisson yard	3,376	5,064	8,440	3,751	5,627	9,378	-	-
Subtotal	91,715	112,068	203,783	101,905	124,522	226,427	115,895	82.3
B. Equipment								
Container cranes	827	9,220	10,047	919	10,244	11,163	10,244	7.3
Transfer cranes	875	9,735	10,610	973	10,817	11,790	10,817	7.7
Yard tractor	-	1,266	1,266	-	1,407	1,407	1,407	1.0
Yard chassis	-	595	595	-	661	661	661	0.5
Fork lift trucks	-	413	413	-	459	459	459	0.3
Subtotal	1,702	21,229	22,931	1,892	23,588	25,480	23,588	16.8
C. Tech. Assistance								
Studies & training	2,679	1,133	3,812	2,975	1,260	4,235	1,260	0.9
D. Value added tax and customs duties	11,756	-	11,756	13,061	-	13,061	-	-
Total base cost	107,852	134,430	242,282	119,833	149,370	269,203	140,743	100.0
Physical contingencies (5%)	4,805	6,722	11,526	5,339	7,469	12,807	-	
Total	112,657	141,152	253,808	125,172	156,839	282,010	140,743	
Price contingencies	14,541	27,109	41,650	16,158	30,124	46,282	-	
Grand Total	127,198	168,261	295,458	141,330	186,963	328,292	140,743	

Notes: 1. All figures are round.
2. Exchange rate: US$ 1.00 = Won 900.00 .
3. Items D was excluded from physical and price contingencies.

Sources: Pusan Port Authority and Bank staff.

April 1986

KOREA

PUSAN PORT PROJECT

Project Cost Estimate

(June 30, 1986)

	1986			1987			1988			1989			1990			Total		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
	('000 US$)																	
A. Civil Works																		
South breakwater	4,751	7,127	11,878	6,477	9,716	16,193	5,480	8,219	13,699	1,715	2,574	4,289	-	-	-	18,423	27,636	46,059
North breakwater	-	-	-	-	-	-	997	1,497	2,494	3,941	5,911	9,852	19,767	29,652	49,419	24,705	37,060	61,765
Dredging container terminal	-	-	-	3,993	5,990	9,983	-	-	-	-	-	-	-	-	-	3,993	5,990	9,983
Container terminal wharf	-	-	-	6,118	9,177	15,295	10,111	15,167	25,278	10,114	15,167	25,281	-	-	-	26,343	39,511	65,854
Access road and railway	-	-	-	7,562	1,900	9,462	7,562	1,900	9,462	7,566	1,898	9,464	-	-	-	22,690	5,698	28,388
T junction	-	-	-	-	2,000	2,000	-	1,000	1,000	2,000	-	2,000	-	-	-	2,000	3,000	5,000
Caisson yard	3,751	5,627	9,378	-	-	-	-	-	-	-	-	-	-	-	-	3,751	5,627	9,378
Subtotal	8,502	12,754	21,256	24,150	28,783	52,933	24,150	27,783	51,933	25,336	25,550	50,886	19,767	29,652	49,419	101,905	124,522	226,427
B. Equipment																		
Container cranes	-	-	-	-	4,056	4,056	183	3,854	4,037	736	2,334	3,070	-	-	-	919	10,244	11,163
Transfer cranes	-	-	-	-	4,056	4,056	196	3,854	4,050	777	2,907	3,684	-	-	-	973	10,817	11,790
Yard tractor	-	-	-	-	-	-	-	-	-	-	1,407	1,407	-	-	-	-	1,407	1,407
Yard chassis	-	-	-	-	-	-	-	-	-	-	661	661	-	-	-	-	661	661
Fork lift trucks	-	-	-	-	-	-	-	-	-	-	459	459	-	-	-	-	459	459
Subtotal	-	-	-	-	8,112	8,112	379	7,708	8,087	1,513	7,768	9,281	-	-	-	1,892	23,588	25,480
C. Tech. Assistance																		
Studies & training	239	120	355	812	380	1,192	721	266	987	512	226	738	695	268	963	2,975	1,260	4,235
D. Value added tax and customs duties	1,059	-	1,059	2,225	-	2,225	3,631	-	3,631	3,681	-	3,681	2,465	-	2,465	13,061	-	13,061
Total base cost	9,796	12,874	22,670	27,187	37,275	64,462	28,881	35,757	64,638	31,042	33,544	64,586	22,927	29,920	52,847	119,833	149,370	269,203
Physical contingencies (5%)	437	644	1,081	1,248	1,864	3,112	1,263	1,788	3,050	1,368	1,677	3,045	1,023	1,496	2,519	5,339	7,469	12,807
Total	10,233	13,518	23,751	28,435	39,139	67,574	30,144	37,545	67,688	32,410	35,221	67,631	23,950	31,416	55,366	125,172	156,839	282,010
Price contingencies																		
Annual (%)	5.00	7.00		5.50	7.00		5.50	7.50		5.50	7.70		5.50	7.60				
Compounded (%)	1.25	1.75		6.82	8.87		12.69	17.04		18.89	25.05		25.43	35.65				
Amount	115	237	352	1,788	3,472	5,260	3,364	6,398	9,762	5,427	8,823	14,250	5,464	11,194	16,658	16,158	30,124	46,282
Grand Total	10,348	13,755	24,103	30,223	42,611	72,834	33,508	43,943	77,450	37,837	44,044	81,881	29,414	42,610	72,024	141,330	186,963	328,292

Notes: 1. All figures are round.
2. Exchange rate: US$ 1.00 = Won 900.
3. Items D was excluded from physical and price contingencies.

Sources: Pusan Port Authority and Bank staff.

April 1986

KOREA

PUSAN PORT PROJECT

Project Cost Estimate

(June 30, 1986)

	1986			1987			1988			1989			1990			Total		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
	(million Won)																	
A. Civil Works																		
South breakwater	4,276	6,414	10,690	5,829	8,744	14,573	4,932	7,397	12,329	1,544	2,317	3,861	-	-	-	16,581	24,872	41,453
North breakwater	-	-	-	-	-	-	897	1,347	2,244	3,547	5,320	8,867	17,790	26,687	44,477	22,234	33,354	55,588
Dredging container terminal	-	-	-	3,594	5,391	8,985	-	-	-	-	-	-	-	-	-	3,594	5,391	8,985
Container terminal wharf	-	-	-	5,506	8,259	13,765	9,100	13,650	22,750	9,103	13,650	22,753	-	-	-	23,709	35,559	59,268
Access road and railway	-	-	-	6,806	1,710	8,516	6,806	1,710	8,516	6,809	1,708	8,517	-	-	-	20,421	5,128	25,549
T junction	-	-	-	-	1,800	1,800	-	900	900	1,800	-	1,800	-	-	-	1,800	2,700	4,500
Caisson yard	3,376	5,064	8,440	-	-	-	-	-	-	-	-	-	-	-	-	3,376	5,064	8,440
Subtotal	7,652	11,478	19,130	21,735	25,904	47,639	21,735	25,004	46,739	22,803	22,995	45,798	17,790	26,687	44,477	91,715	112,068	203,783
B. Equipment																		
Container cranes	-	-	-	-	3,650	3,650	165	3,469	3,634	662	2,101	2,763	-	-	-	827	9,220	10,047
Transfer cranes	-	-	-	-	3,650	3,650	176	3,469	3,645	699	2,616	3,315	-	-	-	875	9,735	10,610
Yard tractor	-	-	-	-	-	-	-	-	-	-	1,266	1,266	-	-	-	-	1,266	1,266
Yard chassis	-	-	-	-	-	-	-	-	-	-	595	595	-	-	-	-	595	595
Fork lift trucks	-	-	-	-	-	-	-	-	-	-	413	413	-	-	-	-	413	413
Subtotal	-	-	-	-	7,300	7,300	341	6,938	7,279	1,361	6,991	8,352	-	-	-	1,702	21,229	22,931
C. Tech. Assistance																		
Studies & training	212	108	320	731	342	1,073	649	239	888	461	203	664	626	241	867	2,679	1,133	3,812
D. Value added tax and customs duties	953	-	953	2,003	-	2,003	3,268	-	3,268	3,313	-	3,313	2,219	-	2,219	11,756	-	11,756
Total base cost	8,817	11,586	20,403	24,469	33,546	58,015	25,993	32,181	58,174	27,938	30,189	58,127	20,635	26,928	47,563	107,852	134,430	242,282
Physical contingencies (5%)	393	579	973	1,123	1,677	2,801	1,136	1,609	2,745	1,231	1,509	2,741	921	1,346	2,267	4,805	6,722	11,526
Total	9,210	12,165	21,376	25,592	35,223	60,816	27,129	33,790	60,919	29,169	31,698	60,868	21,556	28,274	49,830	112,657	141,152	253,808
Price contingencies																		
Annual (%)	5.00	7.00		5.50	7.00		5.50	7.50		5.50	7.70		5.50	7.60				
Compounded (%)	1.25	1.75		6.82	8.87		12.69	17.04		18.89	25.05		25.43	35.63				
Amount	103	213	316	1,609	3,124	4,733	3,028	5,758	8,786	4,884	7,940	12,824	4,917	10,074	14,991	14,541	27,109	41,650
Grand Total	9,313	12,378	21,692	27,201	38,347	65,549	30,157	39,548	69,705	34,053	39,638	73,692	26,473	38,348	64,821	127,198	168,261	295,458

Notes: 1. All figures are round.
2. Exchange rate: US$ 1.00 = Won 900.
3. Items D was excluded from physical and price contingencies.

Sources: Pusan Port Authority and Bank staff.

April 1986

Table 4.1

Table 4.4

KOREA

PUSAN PORT PROJECT

Cumulative Disbursement Schedule /a

Years from approval	IBRD fiscal year & quarter	Estimated cumulative disbursements US$ million	%	Cumulative disbursement profile for Korea (%)
Year 1	FY87			
1st half	09/30/86	-	-	
	12/31/86	2.0	1.0	1
2nd half	03/31/87	10.0	7.0	
	06/30/87	18.0	12.0	7
Year 2	FY88			
1st half	09/30/87	27.0	19.0	
	12/31/87	35.0	24.0	18
2nd half	03/31/88	42.0	29.0	
	06/30/88	50.0	34.0	32
Year 3	FY89			
1st half	09/30/88	57.0	40.0	
	12/31/88	65.0	46.0	48
2nd half	03/31/89	72.0	51.0	
	06/30/89	80.0	56.0	63
Year 4	FY90			
1st half	09/30/89	86.0	60.0	
	12/31/89	94.0	66.0	76
2nd half	03/31/90	100.0	71.0	
	06/30/90	106.0	75.0	86
Year 5	FY91			
1st half	09/30/90	113.0	80.0	
	12/31/90	120.0	85.0	93
2nd half	03/31/91	127.0	90.0	
	06/30/91	133.0	94.0	97
Year 6	FY92			
1st half	09/30/91	137.0	97.0	
	12/31/91	141.0	100.0	100

/a Assumptions: Board date in fourth quarter FY86; proposed closing date: December 31, 1991. Disbursement slowed down at the beginning and accelerated at the end of conform to the disbursement profile for Korea.

KOREA

PUSAN PORT PROJECT

Pusan Port Traffic (1975-2001)

('000 revenue tons)

	Actual												Forecast									Annual growth rate (%)	
	1975			1980			1983			1984			1985			1991			1995			2001			'85-'95	'95-'01
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total		
Coal																										
Foreign	26	0	26	570	0	570	258	0	258	259	0	259	304	0	304	451	0	451	627	0	627	956	0	956	6.8%	-2.3%
Domestic	925	0	925	724	0	724	910	0	910	1,139	0	1,139	916	0	916	951	0	951	1,000	0	1,000	1,041	0	1,041	0.8%	0.8%
Total	951	0	951	1,294	0	1,294	1,178	0	1,178	1,398	0	1,398	1,220	0	1,220	1,412	0	1,412	1,627	0	1,627	1,999	0	1,999	2.7%	-0.3%
Petroleum Products																										
Foreign	296	0	296	618	0	618	723	0	723	854	23	857	925	0	925	1,085	0	1,...	1,240	0	1,240	1,437	0	1,437	2.7%	3.0%
Domestic	1,758	18	1,786	2,151	89	2,240	1,9.3	42	1,955	2,143	97	2,240	1,953	51	2,004	2,401	63	2,464	2,852	75	2,927	3,395	88	3,443	3.8%	3.3%
Total	2,054	18	2,082	2,769	89	2,858	2,636	42	2,678	2,977	120	3,097	2,878	51	2,929	3,486	63	3,549	4,092	75	4,167	4,792	88	4,880	3.3%	3.2%
Iron and Steel																										
Foreign	966	529	1,495	1,806	1,751	3,557	2,003	1,694	3,697	2,467	1,987	4,454	1,723	1,402	3,125	2,571	2,098	4,663	3,589	2,920	6,509	4,201	3,418	7,619	6.9%	3.2%
Domestic	0	0	0	0	0	0	692	5	695	716	3	719	589	2	591	1,058	4	1,062	1,664	6	1,670	2,644	10	2,654	9.9%	9.7%
Total	966	529	1,495	1,806	1,751	3,557	2,695	1,897	4,592	5,183	1,990	5,173	2,312	1,404	3,716	3,609	2,096	5,705	5,253	2,926	8,179	6,845	3,428	10,273	7.0%	4.7%
Cement																										
Foreign	0	558	558	0	208	208	0	72	72	0	9	9	0	30	30	0	30	30	0	30	30	0	30	30		
Domestic	1,157	1	1,158	912	1	913	1,376	0	1,376	1,579	0	1,579	1,128	5	1,133	1,128	5	1,133	1,128	5	1,133	1,128	5	1,133		
Total	1,157	559	1,695	912	209	1,121	1,376	72	1,448	1,579	9	1,588	1,128	35	1,163	1,128	35	1,163	1,128	35	1,163	1,128	35	1,163	2.2%	2.4%
Timber																										
Foreign	2,120	656	2,776	1,766	353	2,119	1,441	105	1,546	1,388	68	1,456	1,005	104	1,109	1,250	129	1,379	1,499	155	1,654	1,959	203	2,162	3.7%	3.9%
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	2,120	656	2,776	1,766	353	2,119	1,441	105	1,546	1,388	68	1,456	1,005	104	1,109	1,250	129	1,379	1,499	155	1,654	1,959	203	2,162	3.7%	3.9%
Nonmetallic Ores																										
Foreign	1	359	360	32	254	286	39	213	252	48	198	246	84	149	233	90	159	249	95	168	263	110	195	305	1.1%	3.0%
Domestic	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	1	359	360	33	254	287	39	213	252	48	198	246	84	149	233	90	159	249	95	168	263	110	195	305	1.1%	3.0%
Chemical Fertilizers																										
Foreign	165	0	165	0	6	6	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	165	0	165	0	6	6	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Salt																										
Foreign	11	0	11	12	0	12	2	0	2	0	0	0	11	0	11	15	0	15	20	0	20	27	0	27	5.0%	6.3%
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	11	0	11	12	0	12	2	0	2	0	0	0	11	0	11	15	0	15	20	0	20	27	0	27	5.0%	6.3%
Grain																										
Foreign	977	0	977	1,455	0	1,455	1,804	0	1,804	1,676	0	1,676	1,124	0	1,124	1,649	0	1,649	2,270	0	2,270	3,154	0	3,154	6.6%	6.6%
Domestic	0	1	1	0	0	0	0	0	0	38	2	40	0	0	0	0	0	0	0	0	0	0	0	0		
Total	977	1	978	1,455	0	1,455	1,804	0	1,804	1,714	2	1,716	1,124	0	1,124	1,649	0	1,649	2,270	0	2,270	3,154	0	3,154	6.6%	6.6%
General Cargo /_1																										
Foreign	2,701	3,435	6,136	4,470	8,422	12,892	6,245	11,643	17,888	7,166	13,696	20,862	8,038	21,512	29,550	12,131	32,465	44,596	17,094	45,747	62,841	23,853	63,865	87,725	7.1%	6.9%
Domestic	50	40	90	79	20	99	127	31	158	122	25	147	156	29	185	298	55	353	511	94	605	801	147	948	11.4%	9.4%
Total	2,751	3,475	6,226	4,549	8,442	12,991	6,372	11,674	18,046	7,288	13,721	21,009	8,194	21,541	29,735	12,429	32,520	44,949	17,605	45,841	63,446	24,654	64,010	88,674	7.1%	6.9%
All Cargo																										
Foreign	7,253	5,597	12,850	10,729	10,994	21,723	12,526	13,928	26,454	13,838	19,981	29,819	13,214	23,197	36,411	19,242	34,673	54,117	26,434	49,020	75,454	35,309	67,709	103,018	6.8%	6.4%
Domestic	3,880	60	3,940	3,867	110	3,977	4,978	76	5,054	5,737	127	5,864	4,742	87	4,829	5,826	127	5,953	7,155	180	7,335	8,969	250	9,219	4.3%	4.0%
Total	11,143	5,597	16,740	14,596	11,104	25,700	17,504	14,004	31,508	19,575	16,108	35,683	17,956	23,284	41,240	25,068	35,002	60,070	33,589	49,200	82,789	44,278	67,959	112,237	6.9%	6.3%
/_1: of which Containerized cargo	1,197	2,515	3,672	3,138	7,660	10,798	5,194	11,358	16,552	9,512	13,327	18,899	6,146	14,357	20,503	12,942	28,418	41,360	16,408	40,420	58,828	21,653	47,544	69,197	10.1%	3.3%

Note: All figure are rounded.

Source: KMPA

KORPA

PUSAN PORT PROJECT

Pusan Port Traffic and Forecasts /a
('000 metric tons)

Commodity	Actual							Forecast					Growth rates	
	1975	1977	1979	1980	1981	1982	1983	1985	1986	1991	1996	2001	1985-91	1996-2001
Dry Bulk														
Grain	978	1,301	1,651	1,455	1,547	1,501	1,804	1,124	1,195	1,640	2,261	3,154		
Cement	1,696	3,767	1,657	1,120	1,059	936	1,448	1,163	1,169	1,318	1,530	1,706		
Coal/anthracite	925	762	1,049	1,269	1,759	1,411	1,157	1,220	1,194	1,419	1,623	1,540		
Lumber /b	2,457	3,585	3,009	3,157	2,110	1,839	1,735	1,081	1,102	1,316	1,647	2,179		
Salt	11	18	31	12	10	4	2	8	9	12	15	21		
Other ores	360	650	487	287	301	250	252	233	243	240	265	310		
Iron & steel & scrap	1,495	2,449	3,358	3,557	3,878	3,946	3,897	3,716	4,009	5,762	8,160	9,958		
Subtotal	7,922	12,532	11,242	10,857	10,664	9,887	10,295	8,545	8,921	11,707	15,501	18,868	5.6	4.0
General Cargo														
Machinery	298	339	541	432	571	661	747	638	715	1,285	2,260	4,074		
Other general cargo	2,832	4,563	5,731	5,214	7,227	7,307	8,184	17,475	19,026	27,522	36,341	51,109		
Subtotal	3,130	4,902	6,272	5,646	7,798	7,968	8,931	18,113	19,741	28,807	38,601	55,183	7.2	7.4
Of which, containerized	1,708	3,245	4,508	5,080	6,575	7,087	7,786	9,670	10,563	15,405	20,864	28,727		
Total	11,052	17,434	17,514	16,503	18,462	17,855	19,226	26,658	28,662	40,514	54,102	74,051		
Containers; % of total	15.5	18.6	25.7	30.8	35.6	39.7	40.5	36.3	36.9	38.0	38.6	38.8		
Containers; % of general cargo	54.6	66.2	71.9	90.0	84.3	88.9	87.2	53.4	53.5	53.5	54.1	52.1		
TEU ('000)	261	455	597	633	744	787	898	1,084	1,190	1,752	2,376	3,276	7.4	6.6
Tons/TEU	6.5	7.1	7.6	8.0	8.8	9.0	8.7	8.9	8.9	8.8	8.8	8.8		

/a 1975 to 1983 data are based upon KMPA data in revenue tons, converted to metric tons using factors derived from the February 1981 Korea Port, Phase III Development Study (Volume II "Traffic Forecasts"). 1985 to 2001 data are derived from the Kiri Container Site Selection Study (KMPA, April 1985) undertaken by Kiri-Sekwang Consultants. Factors used to convert revenue to metric tons were 2.05 for general cargo, 1.0 for bulk; average factor is 1.5 for total traffic.

/b "Lumber" includes logs, plywood and sawn timber.

Source: Korea Maritime and Port Administration Statistics; 1985 Container Site Selection Study.

Table 5.3

KOREA

PUSAN PORT PROJECT

Revised Pusan General Cargo Forecast (1983-2001)
('000 Metric tons)

	All general cargo	Containerized	Noncontainerized
1983	8,931/a	7,786	1,145
1984	10,250/a	9,190	1,060
1985	11,020/b	9,835/a	1,185
1986	11,845	10,670	1,175
1987	12,735	11,580	1,135
1988	13,690	12,560	1,130
1989	14,715	13,630	1,085
1990	15,820	14,790	1,030
1991	17,005	15,825	1,180
1992	18,195	16,932	1,263
1996	23,850	22,194	1,656
2001	33,450	29,700	3,750

/a Actual figures.

/b Estimated.

Source: KMPA statistics and Bank estimates based on the following growth rate assumptions:

	General cargo	Container	Gross national product
1980-84	12.8	15.0	7.0
1985-91	7.5	8.5	6.5
1991-96	7.0	7.0	6.0
1996-2001	7.0	6.0	5.5

Table 5.4

KOREA

PUSAN PORT PROJECT

Pusan Container Traffic - Actual and Forecasts by Port Areas
('000 TEU)

Year	Total	Inner harbor (4 berths) Piers 5 and 6	Outer harbor	Inner harbor: containers at general cargo berths Piers 1 to 4	Inner harbor: noncontainerized general cargo ('000 metric tons)
1983	898	501	-	397	1,145
1984	1,054	661	-	393	1,060
1985	1,173	717	-	456	1,185
1986	1,273	773/a	-	500/b	1,175
1987	1,381	881	-	500	1,155
1988	1,498	998	-	500	1,130
1989	1,626	1,126		500	1,085
1990	1,764	964	300	500	1,030
1991	1,914	984	540/c	450	1,080
1992	2,048	745	853/d	450	1,263
1996	2,659	745	1,614/d	300	1,656
2001	3,669	745	2,624/d	300	3,750

/a Designed economic throughput capacity for container berths at Piers 5 and 6 is assumed to be around 745,000 TEU; beyond this level significant queueing will occur.

/b Maximum throughput of general cargo berths assumed to be around 500,000. This throughput thus assumes significant queueing at these berths. Since noncontainerized general cargo is also forecast to be increasing, then no additional spare capacity becomes available over time on the general cargo berths.

/c Capacity of the three berths outer harbor terminal, assuming some scheduling of arrivals opening year is 1990.

/d Outer harbor demand.

Sources: Korea Maritime and Port Administration for 1983 and 1984 data. Mission estimates based upon the Kiri-Sekwang Container Terminal Site Location Study, and revised estimates of Pusan Port Project Bank appraisal mission.

Table 5.5

KOREA

PUSAN PORT PROJECT

Container Ship Movements at Pusan, 1984

Months	Container terminal PCTOC piers 5 and 6			General cargo berths piers 1 to 4		
	Number of ship	Number of TEU	Average TEU handled by ship	Number of ship	Number of TEU	Average TEU handled by ship
1	107	48,349	452	438	27,353	62
2	98	44,971	459	365	27,512	75
3	115	54,541	474	538	37,946	70
4	107	50,250	470	429	30,189	70
5	115	55,871	486	549	37,688	68
6	121	63,977	529	447	29,030	64
7	131	62,443	477	462	35,527	76
8	119	56,985	479	474	31,822	67
9	124	59,406	479	502	32,662	65
10	125	53,740	430	500	38,163	76
11	129	50,713	393	515	29,905	58
12	127	60,220	474	531	35,067	66
Total	1,418	661,466	466	5,750	392,864	68

Source: KMPA, Pusan.

KOREA

PUSAN PORT PROJECT

Operational Parameters Assumed for Economic Evaluation

(container berths)

	General cargo berths used as container berths		Existing container berths	Proposed container berths	
Berths (number)	4	6 /_2	4	1.5	3 /_3
Cranes per berth (number)	1		2	2	
Average crane productivity per hour (TEUs)	12		36	36	
Average crane working hours per day (hours)	18		15	15	
Throughput capacity per berth (TEUs/day)	216		1,080	1,080	
Berth operating days per year (days)	330		330	330	
Maximum berth utilization (%)	90		50	50	
Maximum annual capacity per berth ('000 TEUs)	64		178	178	
Ship arrivals (random/scheduled)	Random		Scheduled	Scheduled	
Average ship size (TEUs)	300		1,500	2,000	
Average shipment size (TEUs)	70		460	550	
Cargo value (W million/TEU)	14.30		14.30	14.30	
Average daily ship cost in port (W million/day)	4.95		11.07	13.59	
Unloading/loading cost (W million/TEU) /_1	0.122		0.048	0.048	

Notes: (i) theoretical daily berth capacity = cranes per berth x average crane productivity per hour x average working hours per day;
(ii) theoretical annual berth capacity = theoretical daily berth capacity x berth operating day per year;
(iii) maximum annual capacity per berth = theoretical annual berth capacity x maximum berth utilization.
(iv) all the figures are rounded.

/_1: It is estimated that the unloading/loading costs of lightering is three time higher then the normal handling charges on berth.
/_2: With project: 4 berths; without project: 6 berths.
/_3: 1.5 berth in 1990 and 3 berths thereafter.

Sources: KMPA and Bank staff.

Jan. 1986

Table 5.6

Table 5.7

KOREA

PUSAN PORT PROJECT

Container Handling Without And With Proposed Berths

(container berths)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
A. TRAFFIC DEMAND ('000 TEUs)	1,054	1,173	1,273	1,381	1,498	1,626	1,764	1,914	2,048	2,192	2,345	2,508	2,559
B. WITHOUT PROJECT													
At General Cargo Berths													
1. Berths (number)	6	6	6	6	6	6	6 /1	6 /1	6 /1	6 /1	6 /1	6 /1	6 /1
2. Traffic ('000 TEUs)	243	271	294	319	346	375	407	442	473	506	541	579	614
3. Annual ship berth days required	1,125	1,255	1,361	1,477	1,602	1,736	1,884	2,046	2,190	2,343	2,505	2,681	2,843
4. Annual ship berth days available	1,980	1,980	1,980	1,980	1,980	1,980	1,980	1,980	1,980	1,980	1,980	1,980	1,980
5. Berth occupancy rate (%)	57	63	69	75	81	88	(95)	(95)	(95)	(95)	(95)	(95)	(95)
6. Waiting time queuing factors	0.02	0.04	0.07	0.11	0.22	0.48	1.33	1.33	1.33	1.33	1.33	1.33	1.33
7. Annual ship waiting days	23	50	95	162	352	833	2,506	2,721	2,913	3,116	3,332	3,566	3,781
Existing Container Berths													
1. Berths (number)	4	4	4	4	4	4	4 /1	4 /1	4 /1	4 /1	4 /1	4 /1	4 /1
2. Traffic ('000 TEUs)	811	902	979	1,062	1,152	1,251	1,357	1,472	1,575	1,686	1,804	1,929	2,045
3. Annual ship berth days required	751	835	906	983	1,067	1,158	1,256	1,363	1,458	1,561	1,670	1,786	1,894
4. Annual ship berth days available	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320
5. Berth occupancy rate (%)	57	63	69	74	81	88	(95)	(95)	(95)	(95)	(95)	(95)	(95)
6. Waiting time queuing factors	0.05	0.08	0.13	0.20	0.37	0.77	2.08	2.08	2.08	2.08	2.08	2.08	2.08
7. Annual ship waiting days	38	67	118	197	395	892	2,612	2,835	3,033	3,247	3,474	3,715	3,940
C. WITH PROJECT													
At General Cargo Berths													
1. Berths (number)							4	4	4	4	4	4	4 /1
2. Traffic ('000 TEUs)							224	196	210	225	241	257	273
3. Annual ship berth days required							1,037	907	972	1,042	1,116	1,190	1,264
4. Annual ship berth days available							1,320	1,320	1,320	1,320	1,320	1,320	1,320
5. Berth occupancy rate (%)							79	69	74	79	85	90	(95)
6. Waiting time queuing factors							0.31	0.13	0.21	0.33	0.62	1.38	2.08
7. Annual ship waiting days							321	118	204	344	692	1,642	2,629
Existing Container Berths													
1. Berths (number)							4	4	4	4	4	4	4 /1
2. Traffic ('000 TEUs)							1,120	982	1,050	1,124	1,203	1,286	1,364
3. Annual ship berth days required							1,037	909	972	1,041	1,114	1,191	1,263
4. Annual ship berth days available							1,320	1,320	1,320	1,320	1,320	1,320	1,320
5. Berth occupancy rate (%)							79	69	74	79	84	90	(95)
6. Waiting time queuing factors							0.31	0.13	0.21	0.33	0.62	1.38	2.08
7. Annual ship waiting days							321	118	204	344	691	1,644	2,627
Proposed Container Berths													
1. Berths (number)							1.5	3	3	3	3	3	3 /1
2. Traffic ('000 TEUs)							420	736	788	843	901	965	1,022
3. Annual ship berth days required							389	681	730	781	834	894	945
4. Annual ship berth days available							495	990	990	990	990	990	990
5. Berth occupancy rate (%)							79	69	74	79	84	90	(95)
6. Waiting time queuing factors							0.43	0.22	0.32	0.46	0.75	1.79	2.66
7. Annual ship waiting days							167	150	234	359	626	1,600	2,516

Notes: (i) annual ship berth days required = traffic/theoretical daily capacity per berth.
(ii) annual ship berth days available = number of berths x berth operating days per year.
(iii) berth occupancy rate = annual ship berth days required / annual ship berth days available.
(iv) waiting time queuing factors = from Port Development, UNCTAD 1978, page 209 and 210.
(v) annual ship waiting days = annual ship berth required x waiting time queueing factors.
(vi) all the figures are rounded.

/1: Traffic would exceed the practical capacity of these berths. For the purpose of the economic evaluation it has been assumed that ways will be found, e.g., through lightering, to move the traffic through the port with waiting times not exceeding those corresponding to 95% berth occupancy rate.

Sources: KMPA and Bank staff.

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KOREA

PUSAN PORT PROJECT

Economic Benefits

Container Berths

(Won billion)

	1990	1991	1992	1993	1994	1995	1996
Ports: Loading/unloading savings	0.04	0.08	0.08	0.09	0.09	0.10	0.10
Ships: Berth days savings	6.54	8.81	9.41	10.04	10.73	11.51	12.21
Waiting days savings	41.62	49.93	51.22	51.34	46.33	23.13	(0.49)
Cargo: Berth days savings	9.81	13.22	14.12	15.07	16.11	17.28	18.32
Waiting days savings	62.47	74.93	76.87	77.05	69.54	34.71	(0.74)
Total	120.48	146.97	151.70	153.59	142.80	86.73	29.40

Note: 1. All the figures are rounded.

Sources: KMPA and Bank staff.

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Table 5.8

KOREA

PUSAN PORT PROJECT

Economic Rate of Return (ERR) and Sensitivity Analysis

Container Berths

(Won Billion)

Year	Base Case: Capital invest.	Base Case: Maint-enance	Base Case: Total Costs	Base Case: Total Benefits	Base Case: Net Cash Flow	Case 1: Costs (+15%)	Case 1: Benefits	Case 1: Net Cash Flow	Case 2: Costs	Case 2: Benefits (-15%)	Case 2: Net Cash Flow	Case 3: Costs (+15%)	Case 3: Benefits (-15%)	Case 3: Net Cash Flow
1986	20.42		20.42		-20.42	23.48		-23.48	20.42		-20.42	23.48		-23.48
1987	58.81		58.81		-58.81	67.63		-67.63	58.81		-58.81	67.63		-67.63
1988	57.65		57.65		-57.65	66.30		-66.30	57.65		-57.65	66.30		-66.30
1989	57.56		57.56		-57.56	66.19		-66.19	57.56		-57.56	66.19		-66.19
1990	47.61	3.19	50.80	120.48	69.68	58.42	120.48	62.06	50.80	102.41	51.61	58.42	102.41	43.99
1991		3.19	3.19	146.97	143.78	3.67	146.97	143.30	3.19	124.92	121.73	3.67	124.92	121.25
1992		3.19	3.19	151.70	148.51	3.67	151.70	148.03	3.19	128.95	125.76	3.67	128.95	125.28
1993		3.19	3.19	153.59	150.40	3.67	153.59	149.92	3.19	130.55	127.36	3.67	130.55	126.88
1994		3.19	3.19	142.80	139.61	3.67	142.80	139.13	3.19	121.38	118.19	3.67	121.38	117.71
1995		3.19	3.19	86.73	83.54	3.67	86.73	83.06	3.19	73.72	70.53	3.67	73.72	70.05
1996		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
1997		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
1998		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
1999		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2000		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2001		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2002		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2003		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2004		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2005		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2006		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2007		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2008		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
2009		3.19	3.19	29.40	26.21	3.67	29.40	25.73	3.19	24.99	21.80	3.67	24.99	21.32
Total	242.05	63.80	305.85	1,214	908	351.75	1,214	862	305.85	1,032	726	351.75	1,032	680
				ERR=	35.0 %		ERR=	30.5 %		ERR=	29.8 %		ERR=	25.5 %

Sources: KMPA and Bank staff.

April 1986

Table 5.9

Table 6.1

KOREA

PUSAN PORT PROJECT

PUMPA INCOME STATEMENT (1983-92)

Won Million

ITEM	Actual 1983	Actual 1984	Estimate 1985	Forecast 1986	1987	1988	1989	1990	1991	1992
TRAFFIC (REV. TONS '000)	31,341	35,556	39,112	41,850	44,779	47,914	51,268	54,837	58,697	62,805
OF WHICH CONTAINERS(TEU '000)	884	1,054	1,060	1,060	1,213	1,316	1,427	1,549	1,680	1,823
I. OPERATING REVENUES										
1. PORT REVENUES	20,445	23,635	25,999	28,653	31,579	34,803	38,356	42,272	46,589	51,345
2. RENTAL REVENUES	8,564	12,945	14,240	15,694	17,296	19,062	21,008	23,153	25,517	28,122
3. EQUIPMENT REVENUES	997	103	113	125	138	152	167	184	203	224
SUBTOTAL	30,006	36,683	40,352	44,472	49,012	54,016	59,531	65,610	72,308	79,691
II. OPERATING EXPENSES										
1. SALARIES	1,213	1,381	1,450	1,568	1,696	1,834	1,984	2,145	2,320	2,509
2. ADMINISTRATION EXPENSES	640	1,061	1,114	1,147	1,182	1,217	1,254	1,291	1,330	1,370
3. MAINTENANCE EXPENSES	3,841	1,498	1,573	1,734	1,955	2,384	2,918	3,498	4,138	4,372
4. DEPRECIATION	3,504	3,830	3,854	4,384	5,008	6,471	8,453	10,618	13,568	14,764
SUBTOTAL	9,198	7,770	7,991	8,834	9,842	11,907	14,609	17,553	21,356	23,016
III. OPERATING INCOME	20,808	28,913	32,360	35,638	39,171	42,109	44,922	48,057	50,952	56,675
IV. NON-OPERATING INCOME										
1. GAIN ON FOREIGN CURRENCY TRANSLATION	0	4,773	0	0	0	0	0	0	0	0
2. OTHERS	4,987	4,041	4,041	4,041	4,041	4,041	4,041	4,041	4,041	4,041
SUBTOTAL	4,987	8,814	4,041	4,041	4,041	4,041	4,041	4,041	4,041	4,041
V. NON-OPERATING EXPENSES										
1. INTEREST	6,275	6,387	7,038	7,259	8,176	10,871	13,797	15,207	16,027	16,048
2. LOSS FROM FOREIGN CURRENCY TRANSLATION	3,046	0	13,819	5,130	0	0	0	0	0	0
SUBTOTAL	9,321	6,387	20,857	12,389	8,176	10,871	13,797	15,207	16,027	16,048
VI. ORDINARY INCOME	16,474	31,340	15,544	27,290	35,036	35,279	35,166	36,891	38,966	44,668
VII. SPECIAL GAIN(LOSS)	(542)	(237)	0	0	0	0	0	9	0	0
VIII. NET INCOME	15,932	31,103	15,544	27,290	35,036	35,279	35,166	36,981	38,966	44,668

Table 6.2

KOREA

PUSAN PORT PROJECT

PDMPA SOURCES & APPLICATIONS OF FUNDS (1983-92)

Won Million

ITEM	Actual 1983	Actual 1984	Estimate 1985	Forecast 1986	1987	1988	1989	1990	1991	1992
INTERNAL CASH GENERATION										
REVENUES	34,993	40,724	44,393	48,513	53,053	58,057	63,572	69,651	76,349	83,732
LESS WORKING COSTS	5,694	3,940	4,137	4,449	4,833	5,436	6,156	6,935	7,768	8,252
TOTAL INT. CASH GENERATION	29,299	36,784	40,256	44,063	48,220	52,621	57,417	62,716	68,581	75,480
GOVERNMENT SUBSIDY	14,915	0	0	0	11,027	0	13,298	28,994	0	0
SALE OF PROPERTIES	0	24,285	0	0	0	0	0	0	0	0
LOANS										
IBRD SECOND	6,855	22	0	0	0	0	0	0	0	0
SFD SECOND	0	0	0	8,457	11,391	11,391	11,391	0	0	0
PUSAN	0	0	0	1,720	25,800	43,860	40,420	27,320	10,320	0
TOTAL LOANS	6,855	22	0	10,177	37,191	55,251	51,811	27,320	10,320	0
TOTAL SOURCES	51,069	61,091	40,256	54,240	96,438	107,872	122,526	119,259	78,881	75,480
APPLICATIONS										
CAPITAL INVESTMENTS										
PUSAN PORT	34,448	11,633	21,127	21,855	67,017	70,669	78,116	66,669	0	0
GANCHEON BAY	3,200	3,692	3,623	11,170	12,051	12,051	12,051	12,051	0	0
TOTAL INVESTMENTS	37,648	15,325	24,750	33,025	79,068	82,720	90,167	78,720	0	0
SUBSIDY REPAYMENT	0	32,312	140	5,027	0	3,591	0	0	37,794	33,358
DEBT SERVICE										
INTEREST	6,275	6,387	7,038	7,259	8,176	10,871	13,797	15,207	16,027	16,048
REPAYMENTS(CURRENT LOAN)	7,146	8,067	8,575	8,761	10,739	18,675	24,858	25,107	25,372	25,657
TOTAL DEBT SERVICE	13,421	14,454	15,613	16,020	18,915	29,546	38,655	40,314	41,399	41,705
CHANGE IN NON-CASH WORK.CAP.	(2,894)	(3,192)	(256)	168	(1,545)	(7,985)	(6,296)	196	(312)	417
TOTAL APPLICATIONS	51,069	61,091	40,256	54,240	96,438	107,872	122,526	119,230	78,881	75,480

Table 6.3

KOREA

PUSAN PORT PROJECT

PUMPA BALANCE SHEETS (1983-92)

Won Million

	Actual		Estimate	Forecast						
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
ASSETS										
CURRENT ASSETS										
ACCOUNTS RECEIVABLE	3,880	3,509	3,860	4,254	4,688	5,167	5,695	6,276	6,377	7,058
STORES	81	43	84	91	289	346	341	511	540	565
OTHERS	5	2	2	2	3	3	4	5	6	6
TOTAL CURRENT ASSETS	3,966	3,554	3,947	4,348	4,990	5,517	6,040	6,792	6,923	7,629
LESS: CURRENT LIABILITIES										
CURRENT LOAN MATURITIES	3,912	8,068	8,575	8,761	10,739	18,675	24,858	25,107	25,372	25,657
OTHERS	2,764	1,388	1,529	1,577	1,777	2,362	2,998	3,305	3,483	3,487
TOTAL CURRENT LIABILITIES	6,676	9,456	10,104	10,338	12,515	21,037	27,856	28,412	28,855	29,145
NET WORKING CAPITAL	(2,710)	(5,902)	(6,158)	(5,990)	(7,535)	(15,520)	(21,816)	(21,620)	(21,932)	(21,515)
FIXED ASSETS										
GROSS VALUE - LAND	88,842	98,056	126,658	138,248	156,245	180,647	206,885	236,495	255,291	268,800
GROSS VALUE - OTHERS	87,003	107,607	107,921	122,764	140,231	181,197	236,694	297,307	379,894	413,392
ACCUMULATED DEPRECIATION	11,226	14,786	18,640	23,025	28,033	34,504	42,958	53,576	67,143	81,907
NET VALUE - OTHER ASSETS	75,777	92,821	89,280	99,740	112,198	146,692	193,737	243,731	312,751	331,484
TOTAL NET FIXED ASSETS	164,619	190,877	215,938	237,987	268,443	327,339	400,622	480,226	568,042	600,284
WORK IN PROGRESS	56,450	17,782	31,685	46,691	90,582	111,483	121,429	126,741	42,634	15,096
TOTAL FIXED ASSETS	221,069	208,659	247,623	284,678	359,025	438,822	522,051	606,967	610,675	615,380
OTHER ASSETS	17	13	18	13	18	14	19	14	19	15
TOTAL ASSETS	218,376	202,770	241,483	278,701	351,509	423,315	500,254	585,362	588,762	593,879
LIABILITIES AND EQUITY										
LONG TERM DEBT										
IBRD FIRST LOAN	36,992	34,228	31,255	30,831	27,915	24,790	21,431	17,823	13,950	9,793
IBRD SECOND LOAN	40,653	34,324	29,027	27,027	22,829	18,630	14,432	10,233	6,035	1,836
SFD FIRST LOAN	24,921	16,854	14,692	13,442	11,594	9,746	7,898	6,049	4,201	2,353
SFD SECOND LOAN	0	0	0	8,457	18,114	25,952	33,791	30,238	26,686	23,133
PUSAN PORT	0	0	0	1,720	25,620	51,840	76,820	94,150	101,150	89,250
TOTAL LONG TERM DEBT	102,566	85,406	74,973	81,478	106,072	130,958	154,371	158,494	152,022	126,365
EQUITY EQUIVALENT										
CAPITAL	74,078	53,279	68,812	64,912	69,850	71,763	78,219	107,779	61,411	28,048
REVALUATION RESERVE	25,800	17,050	35,119	42,443	50,681	60,410	72,313	86,757	104,033	123,501
RETAINED EARNINGS	15,932	47,035	62,579	89,869	124,905	160,184	195,350	232,331	271,297	315,965
TOTAL EQUITY	115,810	117,364	166,510	197,224	245,437	292,357	345,883	426,867	436,740	467,514
TOTAL LIABILITIES AND EQUITY	218,376	202,770	241,483	278,701	351,509	423,315	500,254	585,362	588,762	593,879

Table 6.4

KOREA

PUSAN PORT PROJECT

PUMPA INVESTMENT PLAN (1983-92)

Won Million

	Actual		Estimate	Forecast						
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
TOTAL INVESTMENT										
LAND	25500	8500	11349	19616	25200	21600	25602	0	0	0
OTHERS	17401	6825	13401	14499	45917	54939	54178	81090	0	0
TOTAL	42901	15325	24750	34115	71117	76539	79780	81090	0	0
C.I.P										
LAND	25500	8002	15350	27291	38846	41023	46113	23057	11528	5764
OTHERS	30950	9780	16335	19400	51737	70460	75316	103695	31105	9332
TOTAL	56450	17782	31685	46691	90582	111483	121429	126741	42634	15096
FIXED ASSETS										
LAND	88842	98056	102057	109732	123378	142800	163312	186368	197897	203661
OTHERS	87003	107607	114453	125888	139467	175683	225005	277726	350306	372079
TOTAL	175845	205663	216510	235620	262845	318483	388317	464095	548202	575740
INCREASING C.I.P										
LAND	25500	8500	11349	19616	25200	21600	25602	0	0	0
OTHERS	17401	6825	13401	14499	45917	54939	54178	81090	0	0
TOTAL	42901	15325	24750	34115	71117	76539	79780	81090	0	0
INCREASING FIXED ASSETS										
LAND	0	25998	4001	7675	13646	19423	20511	23057	11528	5764
OTHERS	0	27995	6846	11435	13580	36216	49322	52721	72579	21774
TOTAL	0	53993	10847	19110	27225	55639	69833	75778	84108	27538
GROSS OPERATING FIXED ASSETS	175,845	205,663	234,579	261,012	296,476	361,844	443,580	533,802	635,185	682,192
ACCUMULATED DEPREICIATION	11,226	14,786	18,640	23,025	28,033	34,504	42,958	53,576	67,143	81,907
BASE ON ROI CAL.	164,619	190,877	215,938	237,987	268,443	327,339	400,622	480,226	568,042	600,284

KOREA

PUSAN PORT PROJECT

Assumptions for Financial Projections
1986-1992

I. BASIC REFERENCE DOCUMENTS USED IN FINANCIAL ANALYSIS
- Fifth Five-Year Economic and Social Development Plan
- Investment plan formulated by KMPA
- Maritime and port statistics, 1984
- KMPA financial reports, 1983-1984
- KMPA budget for 1985
- Budget control records and cash disbursemnts, 1985
- Loan contracts
- Pertinent correspondence and records

II. DATA AND ASSUMPTIONS

General

(a) Inflation rate is assumed to be 3% in each year during the projection period.

(b) Foreign exchange rate assumed during the projection is following:

	1984	1985	1986 and thereafter
Other currencies (US$ equivalent)	W758	W860	W900
Riyal (Saudi)	232	235	245

Income Statements

1. Revenues

(a) Port tariffs are projected to increase by 3% annually in accordance with inflation.

(b) Annual increase in traffic volume is projected at growth rates varying between 7.0-8.5% annually, based on past years' trend, KMPA's budget for 1985 and fifth five-year economic and social development plan.

2. Employee Services Expenses and Other Operating Expenses. Employee services are assumed to increase by 5% in real term and other operating expenses are assumed to increase by inflation rate.

3. Maintenance. This consists of dredging cost and expenses for upkeep of port infrastructure, buildings and equipment , and other port properties. This is assumed to increase at the same rate as that of the net depreciable fixed assets in use.

4. Depreciation. A composite useful life of 35 years is used, assuming a scrap value of 10%, based on Korean Tax Laws.

For projection purposes, depreciation is computed starting the year of acquisition/completion.

5. Interest Charges. Interest is computed based on the terms and conditions of the loan agreement.

6. Foreign Exchange Loss. Exchange loss on foreign currency loan is calculated in 1985 and 1986 based on the projected exchange rates.

Sources and Applications of Funds

7. Government Subsidies. Government subsidies are assumed to be provided when internal funds and foreign loans are insufficient to cover expenditures.

8. Loan Disbursement. Drawdowns on loans represent projected availability of foreign loans from IBRD, SFD and ADB, based on the investment plan and financing plan thereon formulated by KMPA.

9. Capital Investments. Capital investment consist of foreign and locally funded port development projects. Projected investment outlays are based on KMPA's investment plans and programs.

10. Debt Service. Comprised of interest charges and repayment of loan principal, debt servicing over the projection period is derived from loan repayment schedules prepared by KMPA.

Balance Sheet

11. Working Capital. Working capital levels are estimated as follows:

(a) Accounts receivable. Yearly increases are based on the growth rates of gross operating revenue.

(b) Stores. Based on the Balance Sheet as of December 31, 1984, stores are projected to increase as same rate as increase of investment amount.

(c) Other Current Assets. Other current assets are made up mainly of prepaid insurance on fixed assets. Annual increase is assumed to be same as the increase of net fixed assets.

(d) Current Loan Maturities. The computation of this account is based on repayment schedules for foreign loans.

(e) Other Current Liabilities. This is composed mainly of accrued interest. This is computed on the basis of interest and amortization schedules.

12. Fixed Assets. Investments in fixed assets are based on KMPA's investment plans and programs.

13. Other Assets. This is composed mainly of advance deposits (key money) on leased properties and are projected to increase by the inflation rate.

14. Long-Term Debt. This account represents year-end balances of loans in accordance with foreign loan agreements.

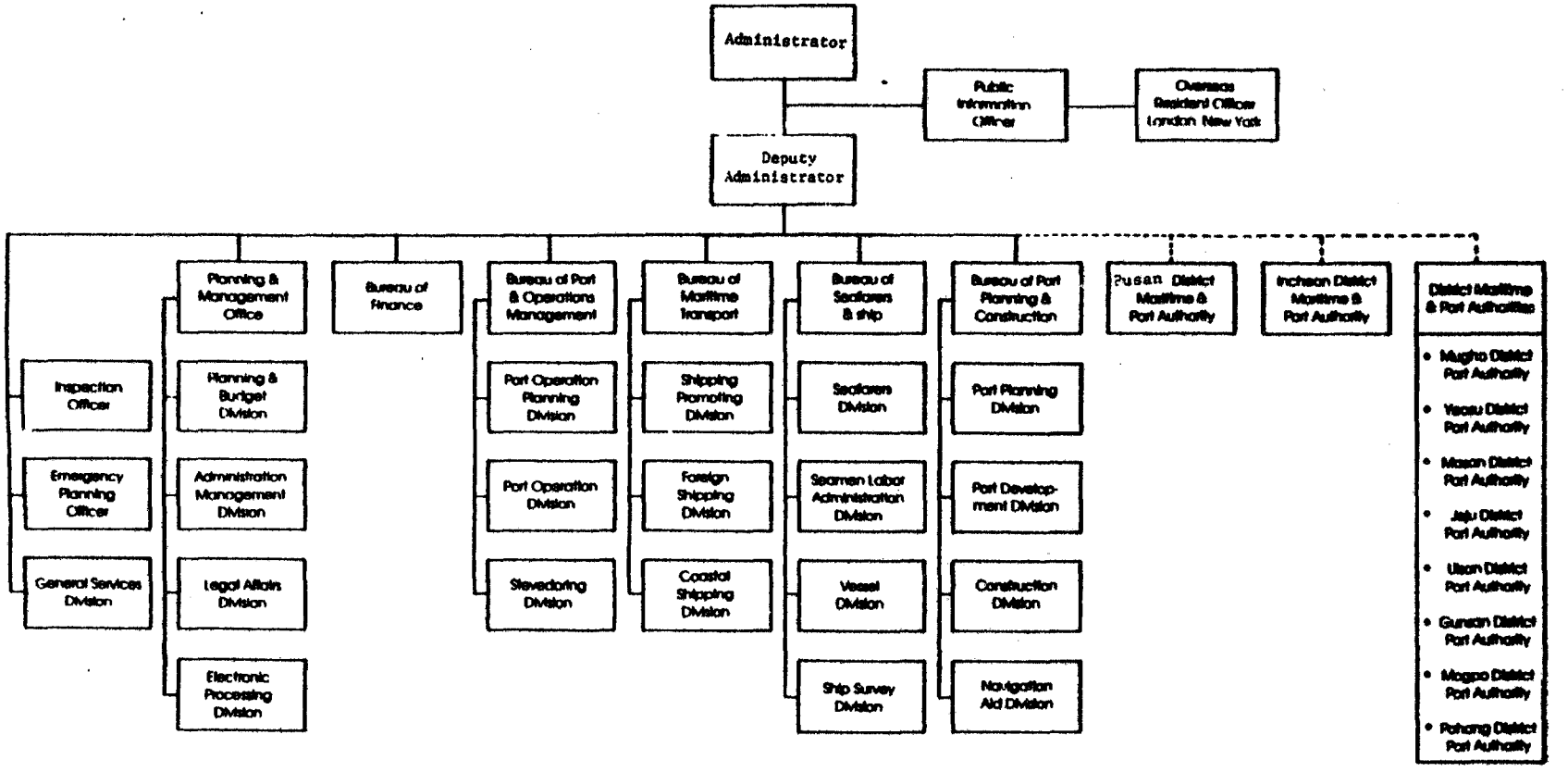
15. Equity Equivalent. This category consists of Capital, Revaluation Surplus and Retained Earnings.

(a) Capital. This is composed of government subsidies and contributions.

(b) Revaluation Surplus. For the projection purpose the fixed assets are revalued by inflation rate during the projection period.

KOREA

KOREA MARITIME AND PORT AUTHORITY (KMPA): ORGANIZATION



Source KMPA

Chart 1

KOREA

PUSAN PORT PROJECT

District Maritime and Port Authority

Organization Chart

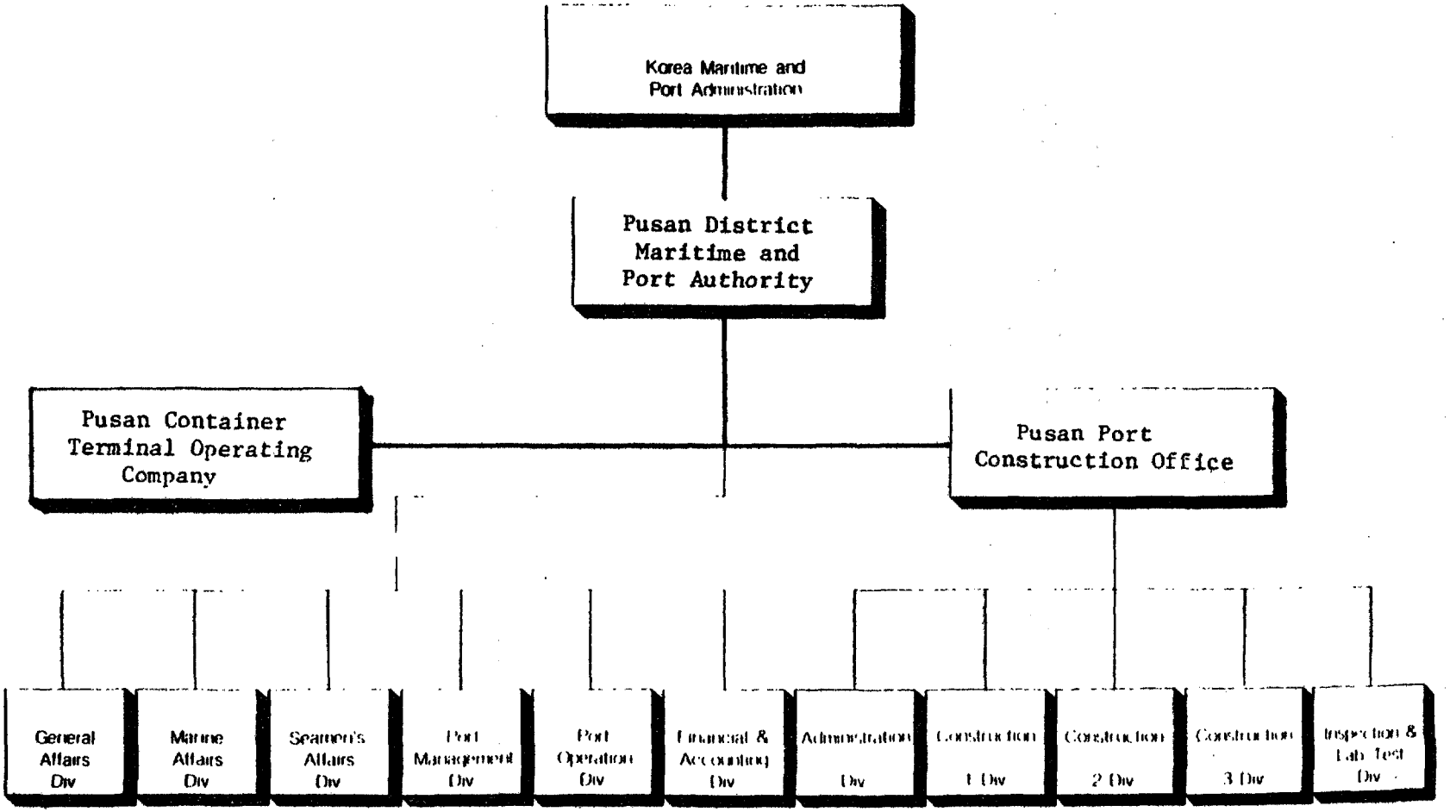
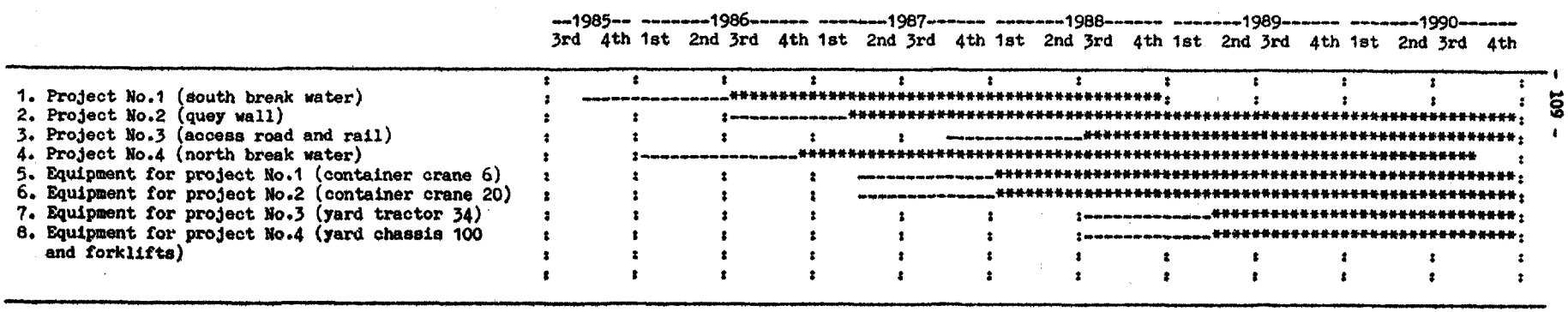


Chart 2

KOREA

PUSAN PORT PROJECT

Implementation Schedule

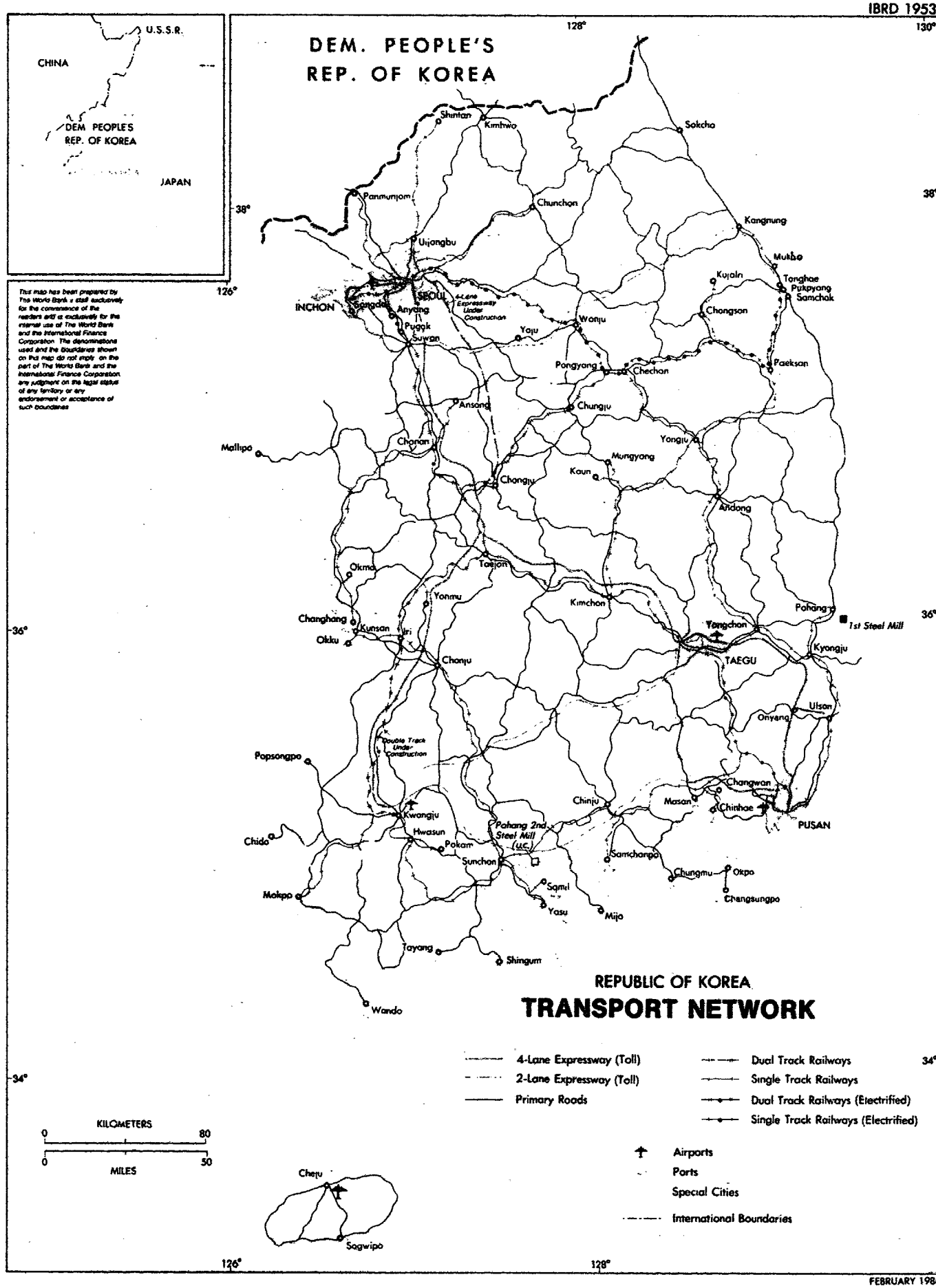


Note: 1. ---------: Preperation of bidding.
*********: Construction.

Source: KMPA and Bank staff.

Feb. 1985

Chart 3



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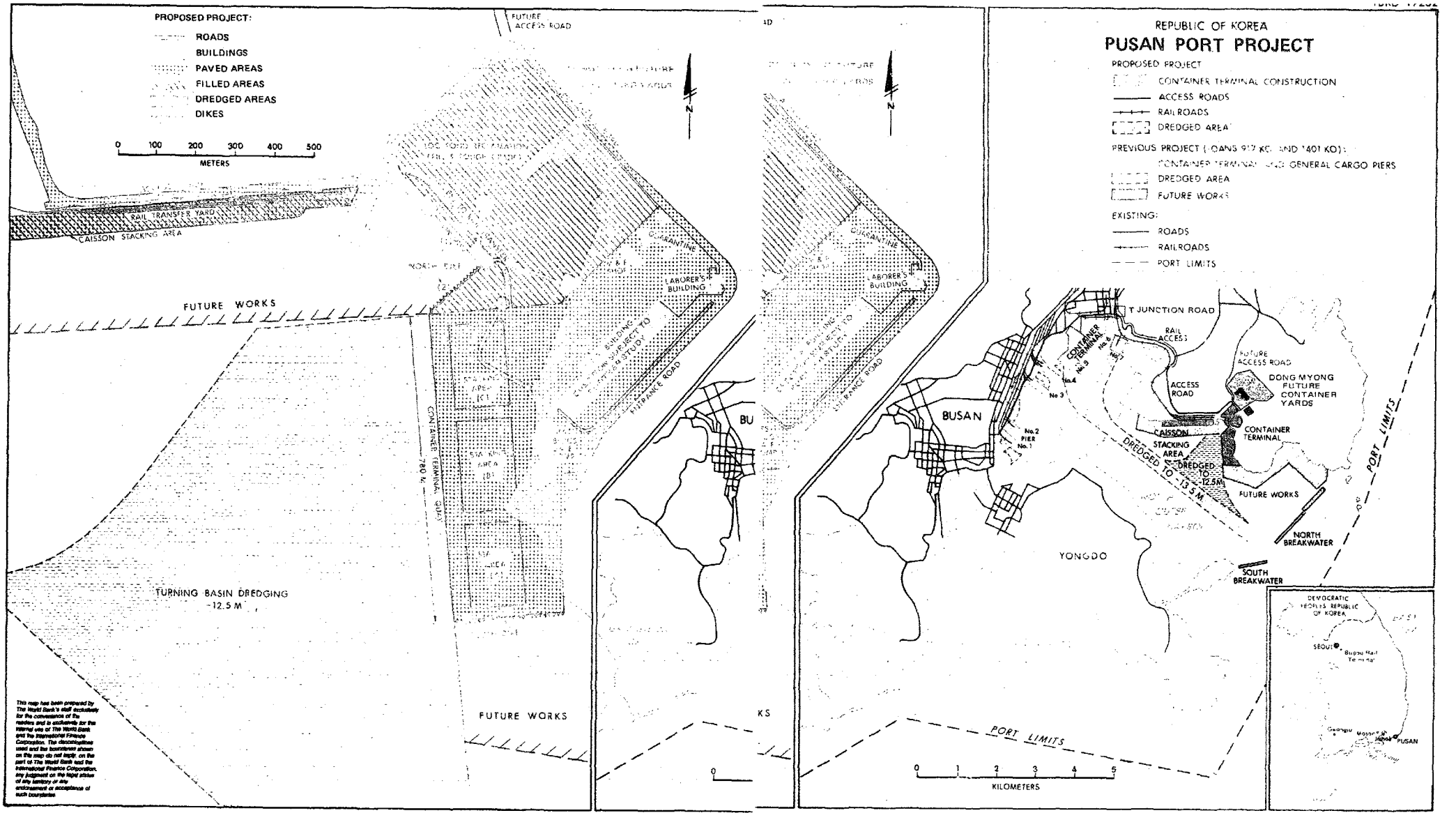
REPUBLIC OF KOREA

TRANSPORT NETWORK

FEBRUARY 1986



DECEMBER 1985